Evaluating Five Proposed

PRICE *and* CREDIT

Policies for the Army

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PREFACE

In the spring of 1998, the Army established a Credit and Pricing Integrated Product Team (CPIPT) to recommend a price and credit policy for Single Stock Fund, an initiative to streamline the Army's financial management system for spare parts. The team was composed of representatives from both the Office of the Deputy Chief of Staff for the Army (Logistics and Financial Management) and the Office of the Secretary of the Army (Financial Management and Comptroller).

The CPIPT developed several alternative price and credit policies. RAND Arroyo Center was asked to evaluate these policies under the aegis of the ongoing project "Using Price and Credit Policies to Facilitate Process Improvement," sponsored by LTG John Coburn, Deputy Chief of Staff for Logistics. This documented briefing presents the results of our analysis of the proposed price and credit policies. It was briefed to the GO/SES Level Maintenance (Worldwide) Conference on October 8, 1998.

The research documented here is being conducted in the Military Logistics Program of RAND's Arroyo Center, a federally funded research and development center sponsored by the United States Army. The Military Logistics Program is directed by John Dumond.

Related logistics research is documented in other RAND publications listed in the bibliography. Army readers interested in RAND publications listed there should contact RAND Distribution Services, 310/451-7002 [voice], 310/452-6915 [fax], or e-mail at order@rand.org.

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SUMMARY

To streamline its financial management system for spare parts, the Army is planning to implement a major initiative called Single Stock Fund (SSF). As part of this implementation, important decisions must be made on the adoption of new price and credit policies for spare parts. The purpose of stock funding is to set up a buyer-supplier relationship between operating units and the Army's wholesale supply system. Logistics customers in operating units receive an Operations and Maintenance Army (OMA) budget to buy spare parts from the wholesale supply system, and they receive credits when they return parts to the wholesale supply system for repair and/or restocking. The Army's wholesale supply system is financed by the Army Working Capital Fund (AWCF).[1] It must cover the cost of maintaining wholesale inventories with the income it receives from sales of parts to logistics customers and maintain a positive cash balance. Thus, price and credit policies affect the supply and repair decisions of logistics customers, as well as the financial health of the wholesale supply system.

In the spring of 1998, the Army established a Credit/Pricing Integrated Product Team (CPIPT) to recommend several alternative pricing and credit policies and a set of criteria by which to assess how these alternatives would affect key Army processes. RAND Arroyo Center was asked to conduct the assessment of these alternatives. This documented briefing presents the results of RAND's analysis of the CPIPT price and credit policy alternatives. We focus on two quantitative criteria. First, the new price and credit policy should enable logistics customers to maintain their current operating tempo (OPTEMPO) without significantly increasing their OMA budget for spare parts. Second, the new policy should not significantly increase the AWCF's costs to replenish wholesale inventories through repair and procurement. An increase in inventory replenishment costs without an equivalent increase in sales revenue would jeopardize the AWCF's ability to break even and maintain its cash balance.

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[1]Currently, AWCF supply management operations are split between the Retail Stock Fund (RSF) and the Wholesale Stock Fund (WSF). The first phase of Single Stock Fund will merge the two stock funds, including installation-level inventories and repair programs currently controlled by the RSF, and incorporate OMA-funded inventories held for redistribution at the installation level.

CURRENT PRICE AND CREDIT POLICY

Under the Army's current price and credit policy, the price of an Army-managed item is set at the Latest Acquisition Cost (LAC) plus a surcharge to cover supply management operating and overhead costs. The credit an OMA-funded logistics customer receives from the RSF for the return of an item depends on the condition of the item (serviceable or unserviceable),[2] average repair and replacement costs by MATCAT (Materiel Category), and whether the item is needed elsewhere on the installation.[3]

For example, when a serviceable Field-Level Reparable (FLR)[4] is needed elsewhere on the installation, the credit is 100 percent of the original purchase price. If the same FLR is unserviceable and there is a local need for it, the credit is 80 percent. However, if the FLR is not needed in local inventory, the credit is only 5 to 15 percent, regardless of its condition. Thus, a broken item may receive 65 to 75 percent more credit than a usable item, depending on local need at the time the item is returned. For serviceable consumables, OMA customers get 100 percent credit if the item is needed locally, but only 5 to 15 percent credit if it is not.

In general, Depot-Level Reparables (DLRs) garner more credit: 100 percent credit for serviceable DLR returns when the item is needed locally, and 45 to 55 percent credit for both serviceable and unserviceable DLRs when the item is not needed. However, DLRs are usually the most expensive category of stock, and such a large difference in credit (45 to 55 percent of the original purchase price of the DLR) can have a big impact on the customer's budget (frequently, thousands of dollars).

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[2] A "serviceable" item is in working condition and can be issued to another customer. An "unserviceable" item must be repaired before it can be returned to inventory.

[3] Technically, the credit is determined by the net asset position (NAP) of the item, as recorded in SARSS (Standard Army Retail Supply System) by RIC-GEO (Routing Identifier Code–Geographical Area), but most installations have only one RIC-GEO. If the NAP (the number of items of that type in inventory) is below the retention limit, the customer receives a much higher credit than if the NAP is above the retention limit.

[4] Items are categorized as Depot-Level Reparables (DLRs), Field-Level Reparables (FLRs), or consumables. DLRs are defined as items that can only be fully repaired at the wholesale, or depot, level. FLRs are repaired at installations in General Support (GS) or Direct Support (DS) maintenance facilities. Consumables are items that are consumed in use, and cannot be repaired. In practice, however, there are some gray areas between these categories. There are some maintenance tasks on DLRs that can be performed at the GS or DS level, and some items categorized as consumables that are being repaired at installations.

Current price and credit policies are motivating logistics customers to engage in behavior that saves OMA funds but may not reduce total costs to the Army. For example, the averaging of credit rates by MATCAT (e.g., all tank and automotive equipment) causes installations to select items with below-average repair costs for local repair programs, although local repair costs may not be lower than wholesale repair costs. As a result of these changes in customer behavior, the Army decided to explore the feasibility of implementing improved price and credit policies as part of its Single Stock Fund initiative.

ALTERNATIVE PRICE AND CREDIT POLICIES

RAND Arroyo Center was asked to evaluate five alternative price and credit policies developed by the CPIPT to address some of the problems with current policy. These alternatives can be summarized as follows:

1. **Dual price.** An exchange pricing system under which the customer would pay the difference between the price and the credit for a purchase accompanied by a return, based on item-by-item repair costs, or full price for a purchase without a return. No credit would be given for unmatched returns (returns without a purchase).

2. **Reduced credit.** Prices and credits would be reduced in parallel, maintaining a net price (price minus credit) equal to repair cost plus surcharge, to reduce the amount of credit issued to customers.

3. **Market price.** A single price would be set for purchases, whether or not they are accompanied by a return, based on market prices for comparable private-sector services. No credit would be given for returns.

4. **Interim policy.** Similar to the current policy, except that credits would be based on item-by-item repair costs and on national need rather than local need.

5. **Dual price+.** Exchange pricing would be implemented as in Dual price, but customers would receive credit for unmatched returns based on condition and item-by-item actual repair costs.

The CPIPT also proposed a set of criteria to evaluate the proposed alternatives. These included financial criteria, such as the impact of price and credit policies on OMA budgets and AWCF cash balance, and behavioral criteria, such as customer incentives to make appropriate use

of installation versus depot repair, local purchase, and redistribution of spare parts outside the AWCF.

This documented briefing focuses on the financial criteria that could be evaluated with available Army data on purchases, returns, and inventories. We estimate the OMA funds that would be needed under each alternative in each of two cases: (1) holding purchases and returns constant and (2) assuming a modest behavioral change by customers. We also estimate changes in AWCF inventory replenishment costs, assuming some behavioral change by customers. (If there is no change in the number of items purchased or returned, AWCF inventory replenishment costs would not change.)

We are not able to estimate the effects of the alternative price and credit policies on the individual behavioral criteria, because Army data do not allow us to estimate potential behavioral changes on an item-by-item basis, nor are detailed data available on the costs of non-AWCF transactions, such as local purchase and redistribution. However, the use of behavioral criteria to develop an optimal price and credit policy is discussed in a forthcoming RAND report entitled *Right Price, Fair Credit: Criteria to Improve Financial Incentives for Army Logistics Decisions*, MR-1150-A, forthcoming.

RESEARCH RESULTS

Among the CPIPT alternatives, we found that Dual price+ is preferred based on its estimated effects on OMA budgets and AWCF inventory replenishment costs. Its relatively generous credit policy, based on the condition of the item and actual repair and restocking costs at the installation and wholesale levels, reduces the amount of OMA funds needed to make the same purchases and returns observed in the data. When potential behavioral changes by customers are taken into account, OMA budgets are further reduced, even though total purchases increase, because returns are also increasing. The availability of returns is also crucial in keeping AWCF inventory replenishment costs close to their current level, despite increased demands. When serviceable returns are available to redistribute, and unserviceable returns are available to repair, the Army can avoid costly procurements.

The Interim policy is also a viable alternative, in the sense that it requires a lower OMA budget than the current price and credit policy and it results in only slightly higher AWCF inventory replenishment costs. However, it does not perform as well as Dual price+ because of three important

distinctions. First, it bases credits for unserviceable FLRs on wholesale repair costs, which are generally higher than installation repair costs, resulting in higher OMA budgets than Dual price+. Second, it gives no credit for consumables, resulting in higher OMA budgets and higher procurement costs. Third, it gives no credit for items in long supply at the national level, resulting in higher OMA budgets and creating financial incentives for customers to repair and redistribute these items outside the AWCF.

The Dual price and Market price alternatives result in both higher OMA budgets and higher AWCF replenishment costs because of the lack of credits for unmatched returns. Customers require more OMA funding to make up for the lack of credit, and procurement costs increase because returns are not available for repair and redistribution. The Reduced credit alternative does not require higher OMA budgets, because prices and credits are reduced in parallel, but the reduction in credit for unmatched returns is likely to lead to higher procurement costs, because fewer returns will be available for repair and redistribution.

The Army has chosen to implement a modified version of the Interim policy as its initial credit policy for SSF because of concerns about the potential financial impacts of exchange pricing on the AWCF and the cost of developing a system to match purchases with returns.[5] However, a variant of Dual price+ with separate price and credit transactions instead of exchange pricing could be implemented (with current systems) to avoid these problems. The Army could thus get most of the benefits of Dual price+ with implementation costs similar to those for the Interim policy.[6]

The Army could then make a separate decision about whether to implement Dual price+ with exchange pricing as a future SSF price and

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[5]Within the Army there is much disagreement about the field's response to exchange pricing. Many believe that fewer carcasses will be returned if exchange pricing is implemented and that the Army will not be able to recover the price difference between the exchange price and the full price. Others point to the division comptroller's office, where unmatched "recoverables" are carefully monitored. In today's Army, if a carcass is not returned, the installation OMA account is negatively affected. Under exchange pricing, if a carcass were not returned and the price difference not recovered from the OMA account, the AWCF would be negatively affected.

[6]Some members of the Army financial community have expressed concern that the higher credits offered under Dual price+ would deplete AWCF cash balances rather than bringing more transactions back into the AWCF. These concerns could be addressed by pilot projects that adjusted credits for groups of items to assess the impacts on demands and returns.

credit policy. Exchange pricing has the additional advantages of reducing the number of financial transactions and simplifying unit-level financial management. However, its effects on AWCF cash balances and its implementation costs would have to be analyzed.

Finally, some additional refinements to either Interim policy or Dual price+ could increase the benefits to the Army of implementing a new price/credit policy.

Under SSF once wholesale and retail stocks are combined, new policies for identifying and managing items in long supply will be required. These policies should be tailored to the individual item. For example, if the Army has many unserviceable items and few serviceable items of a particular type in its wholesale inventories, the price and credit should be set to encourage customers to return serviceable items in local inventories that can be used as a source for filling demands before unserviceable carcasses are repaired.

Items that are currently being repaired in the field at the GS level should be reviewed to determine if that is the appropriate level for repair. In addition, items being repaired at the Army's depots or by contractors should be studied to determine whether they can be repaired more economically elsewhere.

As will be discussed in the forthcoming *Right Price, Fair Credit: Criteria to Improve Financial Incentives for Army Logistics Decisions,* the Army should review each component of the surcharge and consider direct funding those components not directly related to Army supply management activities. The inclusion of costs that do not vary with supply and repair transactions distorts customers' supply and repair decisions by making the wholesale logistics system seem more expensive than it actually is. In addition, costs that vary on an item-by-item basis, such as transportation and restocking costs, condemnation rates, or losses and obsolescence, should be allocated to individual prices or credit rates on an item-by-item basis, rather than as a percentage of the purchase price.

ABBREVIATIONS

ABF	Asset Balance File
ADP	Automated Data Processing
AMC	U.S. Army Materiel Command
AMCOM	U.S. Army Aviation and Missile Command
AMDF	Army Master Data File
ASL	Authorized Stockage List
AWCF	Army Working Capital Fund
BASOPS	Base Operations
CPIPT	Credit/Pricing Integrated Product Team
CTASC	Corps/Theater ADP Service Center
DLA	Defense Logistics Agency
DLR	Depot-Level Reparable
DS	Direct Support
DWCF	Defense Working Capital Fund
EMIS	Executive Management Information System
FEDLOG	Federal Logistics Data
FLR	Field-Level Reparable
FMMC	FORSCOM Materiel Management Center
FORSCOM	U.S. Army Forces Command
FY	Fiscal Year
GS	General Support
GSA	General Services Administration
ILAP	Integrated Logistics Analysis Program
ISM	Integrated Sustainment Maintenance
LAC	Latest Acquisition Cost
MATCAT	Materiel Category
MRC	Materiel Recovery Code

NAP	Net Asset Position
NSN	National Stock Number
NSNMDR	National Stock Number Master Data Record
OMA	Operations and Maintenance, Army
OPTEMPO	Operating Tempo
RIC-GEO	Routing Identifier Code–Geographical Area
RO	Requirements Objective
RPI	Reduced Price Initiative
RSF	Retail Stock Fund
RX	Reparable Exchange
SARSS	Standard Army Retail Supply System
SC	Surcharge
SMA	Supply Management Army
SSF	Single Stock Fund
STARFIARS	Standard Army Financial Inventory Accounting and Reporting System
TRADOC	U.S. Army Training and Doctrine Command
WSF	Wholesale Stock Fund

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Evaluating Five Proposed Alternative Price and Credit Policies for the Army's Credit and Pricing IPT

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To streamline its financial management system for spare parts, the Army is planning to implement a major initiative called Single Stock Fund (SSF). As part of this implementation, important decisions must be made on the adoption of new price and credit policies for spare parts. Because price and credit policies influence the behavior of logistics customers in the Army's operating units, they can affect the success of logistics initiatives such as the realignment of local inventories (known as authorized stockage levels, or ASLs), changes in repair programs such as Integrated Sustainment Maintenance (ISM),[7] and the reduction of excess inventories at the wholesale level.

In the spring of 1998, the Army established a Credit/Pricing Integrated Product Team (CPIPT)[8] to recommend several alternative price and credit policies as well as a set of criteria by which to assess their effects on key Army processes. RAND Arroyo Center was asked to conduct the assessment of the alternatives.

This briefing presents RAND Arroyo Center's evaluation of the proposed pricing and credit policy alternatives. We used the CPIPT criteria to assess how well

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[7]Under ISM, installation repair facilities bid to become Centers of Excellence for the repair of specific items. The winning installation performs all repairs on that item for other installations in the same region. ISM is intended to reduce the costs and improve the quality of repairs.

[8]The representatives to the CPIPT are listed in Appendix G.

each alternative supports logistics initiatives, improves business processes, and makes more efficient use of logistics resources.

In 1992, the Army Changed Its Logistics Financial Management System

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Before 1992	– Installations did not have to pay for major reparable parts – Supply managers received budgets for procurement and repair
After 1992	– Installations now receive budgets to buy parts – Supply managers must use income from installations to pay for procurement and repair
1995	– The Army adopted Velocity Management – Some performance deficits of key logistics processes were traced to financial management
1996	– Financial Management Process Improvement Team (PIT) was chartered to examine how financial policies influence logistics behavior
1997	– The Defense Business Operations Fund was replaced by four "working capital funds," one of which is the Army Working Capital Fund (AWCF)

In FY92 both the Army and the Air Force made fundamental changes in the way major reparable parts were provided to operating forces.[9] The purpose of the change was

> to create a customer-provider relationship between military operating units and support organizations. This relationship is designed to make managers of support organizations funded through DWCF [Defense Working Capital Fund] and decision-makers at all levels more concerned with the costs of goods and services. Requiring the operating forces to pay for support they receive provides increased assurance that services supplied and paid for are actually needed.[10]

In FY97, DoD decided to give the services and DoD-wide agencies responsibility for their own cash management in separate working capital funds, one of which is the Army Working Capital Fund (AWCF). All these changes in logistics and financial management have significantly affected the way operating units conduct their daily business.

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[9]The Navy had adopted a similar funding mechanism in the early 1980s.

[10]*DoD Financial Management Regulation*, Vol. 2B, Chapter 9, "Defense Working Capital Funds Activity Group Analysis," July 1998, p. 9-1.

Single Stock Fund Will Merge RSF and WSF
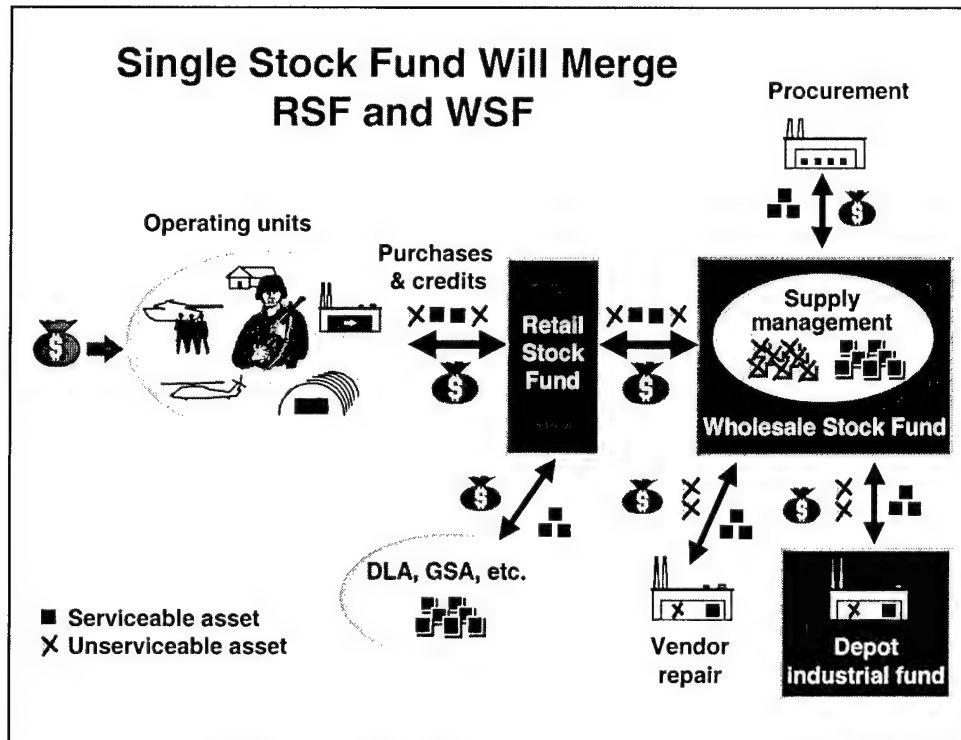
Under the Army's implementation of working capital funds, logistics customers in operating units receive a budget for spare parts as part of their Operations and Maintenance, Army (OMA) budget. They use these funds to purchase parts from wholesale suppliers, such as U.S. Army Materiel Command (AMC), the Defense Logistics Agency (DLA), and the General Services Administration (GSA). They receive credits when they return parts in need of repair (unserviceable returns), or parts in working condition that are not needed in local inventories (serviceable returns).

Currently, all parts transactions between OMA-funded logistics customers and wholesale suppliers pass through the Retail Stock Fund (RSF).[11] Purchases pass through the RSF at the same price charged by the wholesale source of supply. However, the RSF issues credits immediately to OMA customers while it awaits credit from wholesale suppliers, and it offers different credit rates than it receives from wholesale suppliers. The RSF holds some inventories of supplies to

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[11]Each of the Army's Major Commands (MACOMs)—such as U.S. Army Forces Command (FORSCOM), U.S. Army Training and Doctrine Command (TRADOC), and U.S. Army Europe (USAREUR)—controls a branch of the RSF. Each installation has a RSF office that maintains an accounting record of all its RSF transactions.

support repair programs and nondivisional logistics customers,[12] and it partially finances installation-level Reparable Exchange (RX) and ISM repair programs.

The Wholesale Stock Fund (WSF) finances AMC's wholesale inventories of depot-level reparables (DLRs), field-level reparables (FLRs), and Army-unique consumables.[13] It uses revenues from sales of spare parts to maintain demand-supported wholesale inventories of parts, by procuring replacements or buying repairs from commercial vendors or from the Army's maintenance depots. Its sales revenues must also cover AMC's operating and overhead costs associated with supply management.

Depot maintenance is financed by the depot maintenance industrial fund. The prices paid by the WSF for depot repairs cover the depot's labor, parts, and overhead costs. The Army's stock funds and industrial funds are collectively known as the Army Working Capital Fund (AWCF). The RSF and the WSF make up the Supply Management Army (SMA) business area of the AWCF. Each business area must be budgeted to break even over the budget period, and the AWCF as a whole must maintain a cash balance to cover 7–10 days of operating expenses ($1.5 to $2.1 billion) and 4–6 months of capital disbursements ($0.5 to $0.9 billion).[14]

In its first phase, Single Stock Fund (SSF) will combine the operations of the RSF and the WSF, and eliminate the purchase and credit transactions between the two entities. It will also take over OMA-funded inventories of items that are currently held at the installation level for redistribution. AMC will become the owner of the inventories currently financed by the RSF and the inventories held in OMA retention warehouses, and it will reimburse installations for RX and ISM repairs.

The advent of SSF creates an opportunity for the Army to improve its price and credit policies at the interface between OMA-funded customers and AWCF-funded suppliers.

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[12]Operating units that form part of the Army's divisions typically have OMA-funded inventories to support their operations. Nondivisional units, such as engineers and military police, are currently supported directly by the installations' RSF.

[13]DLRs are defined as items that can only be fully repaired at the wholesale, or depot, level. FLRs are repaired at installations in General Support (GS) or Direct Support (DS) maintenance facilities. Consumables are items that are consumed in use and cannot be repaired. In practice, however, there are some gray areas between these categories. There are some maintenance tasks on DLRs that can be performed at the GS or DS level, and some items that are categorized as consumables are being repaired at installations.

[14]DoD Financial Management Regulation, Vol. 11B, p. 54-16.

Under the Army's current price and credit policy, the price of an Army-managed item is set at the Latest Acquisition Cost (LAC) plus a surcharge to cover supply management operating and overhead costs. The credit an OMA customer receives from the RSF for the return of an item depends on the condition of the item (serviceable or unserviceable), average repair costs by MATCAT (Materiel Category), and whether the item is needed elsewhere on the installation.[15]

Setting credits on the basis of average repair costs over a broad range of items instead of the specific repair costs for the item creates a financial incentive for OMA customers to select items with below-average repair costs for installation repair programs, and to return items with above-average repair costs to the wholesale system.

Basing credits on local need creates uncertainty for OMA customers. When a serviceable FLR is needed elsewhere on the installation, the credit is 100 percent of the original purchase price. If the same FLR is unserviceable and there is a local need, the credit is 80 percent. However, if the FLR is not needed in local inventory, the credit is only 5 to 15 percent, regardless of its condition. Thus, a

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[15]Technically, the credit is determined by the Net Asset Position (NAP) of the item, as recorded in SARSS (Standard Army Retail Supply System) by RIC–GEO (Routing Identifier Code-Geographical Area), but most installations have only one RIC-GEO. If the NAP (the number of items of that type in inventory) is below the retention limit, the customer receives a much higher credit than if the NAP is above the retention limit.

broken item may receive 65 to 75 percent more credit than a usable item, depending on local need at the time the item is returned. For serviceable consumables, OMA customers get 100 percent credit if the item is needed locally, but only 5 to 15 percent credit if it is not.

In general, DLRs garner more credit: 100 percent credit for serviceable DLR returns when the item is needed locally, and 45 to 55 percent credit for both serviceable and unserviceable DLRs when the item is not needed. However, DLRs are usually the most expensive category of stock, and such a large difference in credit (45 to 55 percent of the original purchase price of the DLR) can have a big impact on the customer's budget (frequently, thousands of dollars).

Current price and credit policy encourages OMA customers to seek alternative sources of supply and repair and to redistribute items among themselves rather than return them to the AWCF. For example, the ISM program has enabled installations to share their GS repair capabilities and capacities, and to repair more items that would previously have been returned to the wholesale supply system. When DLRs are repaired in the ISM or RX program, customers receive 80 percent credit (when the item is needed locally) rather than 45 to 55 percent credit when DLRs are repaired by the wholesale system.[16] In addition, most installations have set up OMA-funded redistribution centers, which enable them to hold serviceable items no longer needed by one OMA customer for resale to other OMA customers (at 100 percent of the purchase price) rather than returning them to the AWCF for lower credit.[17] Although these activities save OMA funds at the local level, it is not clear that they are cost-effective from an Army-wide perspective, because installations may be duplicating supply and repair capacity that already exists in the wholesale system.

The expanded repair and redistribution activities by OMA customers cause sales to the AWCF to decline. Since the surcharge is collected as a percentage of sales, it becomes more difficult for the AWCF to recover its operating costs and maintain its cash balance. OMA customers often engage in entrepreneurial behavior to reduce purchases or increase credits, because they can use the additional funds to supplement their OMA budget in chronically underfunded areas, such as Base Operations (BASOPS).

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[16]Many items categorized as DLRs have GS-level repair tasks that can be performed in installation repair facilities if the capability and capacity are available. The alternative is to send the item back to the wholesale supply system for a depot-level overhaul and to buy a replacement.

[17]The OMA savings generated by reselling items through OMA retention facilities typically remain within the division and can be redistributed among units. However, SARSS has been modified to allow redistribution between installations and billing of the receiving customer.

The CPIPT proposed a list of criteria to evaluate the alternative price and credit policies. This briefing will focus on the quantitative criteria. First, the new price and credit policy should allow the Army's operating units to maintain their current operating tempo (OPTEMPO) without significantly increasing their OMA budgets for spare parts. To evaluate this criterion, we calculated the amount of OMA that operating units would need under each price and credit policy to buy the same items they currently buy. We also modeled the sensitivity of demands and returns to changes in prices and credits, and estimated the amount of OMA that would be needed if customers changed their demand patterns.[18]

Second, the new price and credit policy should allow the AWCF (specifically, the SMA business area) to continue to break even and maintain its cash balance. Because of data limitations, we were not able to simulate the day-to-day cash balances of the SSF, but we did estimate cash outflows that would be required to replenish AWCF inventories so that the supply system could continue to meet demands in the future. A price and policy that significantly increased AWCF inventory replenishment costs without increasing revenues would make it difficult for the SSF to break even.

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[18]Our analytic methodology is described in greater detail below.

The remaining criteria could not be assessed quantitatively, because we do not have sufficient data to predict customer responses to price and credit changes on an item-by-item basis. Based on economic theory, however, customers will have the correct financial incentives to make appropriate use of installation versus depot repair, local purchase, and redistribution when prices and credits reflect the actual costs[19] of supply and repair in the Army's wholesale logistics system. When prices and credits reflect actual costs, customers will have a financial incentive to go outside the Army's wholesale logistics system only when it is less expensive from an Army-wide perspective. Thus, customers will be more likely to use the Army's supply and repair systems as they were designed, rather than developing new supply, repair, and redistribution channels. Keeping transactions within the Army's wholesale logistics system will also improve the financial health of the AWCF.

For example, if credits for unserviceable returns were based on actual repair costs on an item-by-item basis, rather than being averaged by MATCAT, customers would no longer have a financial incentive to develop repair capacity for items with below-average repair costs. The AWCF would also be more likely to break even, because its revenues would be better matched to its costs on an item-by-item basis.

Customers' ability to adjust local inventories depends on the credit policy for serviceable returns. The cost to the Army of a serviceable return is the shipping and handling required to return the item to inventory for reissue to another customer. Thus, the credit for a serviceable return should be the purchase price minus the shipping and handling costs. If credits are lower, customers may not be able to adjust their inventories to meet demands when it would be cost-effective from an Army perspective, and they will have a financial incentive to set up alternative redistribution channels.

Financial uncertainty is created by the current credit policy's dependence on local need for the item, which can change from day to day. Financial uncertainty can be reduced by making credit dependent on national need rather than local need, a basis that does not fluctuate so frequently.

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[19] An economist would call these marginal costs.

CPIPT Designed Five Alternatives to Address Current Problems

Name	Description
1. Dual price	• Pay repair cost + surcharge for requisition with return; pay full price for requisition without return; no credit for unmatched returns
2. Reduced credit	• Lower prices and credits; no credit for consumables
3. Market price	• Single sales price, no credit; surcharge costs are directly funded
4. Interim policy	• Current wholesale prices and credits; no credit for consumables or items in long supply
5. Dual price+	• Same as Interim policy with four modifications: RX repair costs for FLRs, credit for serviceable consumables, nonzero credit for reparables, dual pricing

All have item-by-item credit and eliminate dependence on local need

The CPIPT proposed five alternative price and credit policies to address some of the problems with current policy.

Each of the alternatives includes elements that should improve logistics decisionmaking, based on the qualitative criteria. They all base prices and/or credits on item-by-item repair costs rather than MATCAT averages. This policy change should improve OMA customers' repair-versus-buy decisions. The alternatives that offer credit (Reduced credit, Interim policy, and Dual price+) also eliminate the credit rate's dependence on local need and give higher credit for a serviceable return than for an unserviceable return. Greater financial certainty and better reflection of actual costs in credits (or penalties) should motivate OMA customers to return items to the wholesale supply system.[20]

The alternative price and credit policies for DLRs and FLRs are summarized below. (They are described in greater detail in Appendix A.) All of the alternatives retain the current pricing system for consumables,[21] many of which are non-Army-managed. No alternative except Dual price+ offers credit for

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[20]Serviceable returns are an inexpensive replenishment source for the Army's supply system.

[21]Under current policy, the price equals the latest acquisition cost (LAC) plus the surcharge.

consumable returns, whereas Dual price+ offers credit for consumables with a purchase price greater than \$50.[22]

Alternative 1 (Dual price)[23] sets the price for a requisition with a return equal to the wholesale repair cost plus the surcharge for DLRs or to the installation repair cost plus the surcharge for FLRs, and the price for a requisition without a return equal to LAC plus the surcharge. However, it gives no credit for serviceable or unserviceable returns without a matching requisition. (We call these "unmatched returns.")

Alternative 2 (Reduced credit) lowers both the price for a requisition and the credit for a return in parallel, from a starting point where prices are based on LAC plus the surcharge and credits are based on LAC minus wholesale repair costs for DLRs and LAC minus installation repair costs for FLRs. The CPIPT envisioned a gradual adjustment process of small price and credit reductions over several years. Credits would be reduced over time in order to reduce the customer's reliance on credit, and prices would also be reduced to prevent a build-up of cash in the AWCF. For our analysis, we assumed that the ending point of this process would be a reduction in both prices and credits of approximately 25 percent below current levels.

Alternative 3 (Market price) establishes a policymaking board to set a "market price" for each item, and offers no credit for returns.[24] It also provides for direct funding of the costs currently covered by the supply management surcharge. As a proxy for the market price, we used the current average of repair and replacement costs based on current return rates.[25] This policy should allow the AWCF to break even, assuming no change in customer behavior.

Alternative 4 (Interim policy) is based on the prices and credits that are currently exchanged between the Army's Wholesale and Retail Stock Funds (WSF and RSF). Prices are set at LAC plus the supply management surcharge. Credits are set at LAC for serviceables and LAC minus wholesale repair costs for

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[22]Low-value items are not likely to warrant the time, cost, and effort required to return them to the supply system. Thus, it is better to retain them locally for other customers, or dispose of them locally.

[23]Dual pricing is also sometimes referred to as "exchange pricing."

[24]Wholesale repair prices would be determined by an impartial/independent cost board made up of Army and industry to be comparable with market prices for similar repairs (these prices should, by definition, include industry-standard overhead costs).

[25]In other words, if 80 percent of OMA customer purchases are currently requisitions with returns, and 20 percent are requisitions without returns, the Army could repair to meet 80 percent of demands, but would have to procure to meet the other 20 percent of demands. The proxy market price, set to reflect average AWCF repair and replacement costs, would be $.8 *$ wholesale repair cost $+ .2 *$ LAC. Since we have no data on market repair costs, we use AWCF wholesale repair costs as a proxy.

unserviceable DLRs and FLRs, except for items in long supply at the wholesale level, which receive no credit. Alternative 4 has been proposed as an interim policy for the initial implementation of SSF, until the Army chooses and implements a permanent price and credit policy.

Alternative 5 (Dual price+) is similar to Alternative 1 (Dual price) in some respects, and to Alternative 4 (Interim policy) in others. It sets the price for a requisition with a return equal to the repair cost plus the surcharge, and the price for a requisition without a return equal to LAC plus the surcharge. However, it offers a credit of LAC for unmatched serviceable returns and a credit of LAC minus repair cost for unmatched unserviceable returns. It also offers a credit of the original price minus a surcharge (i.e., LAC) for serviceable consumables with a price greater than $50.

Note that each of the alternatives except Alternative 4 (Interim policy) reduces the price a customer pays for a requisition when a return is expected and reduces the total amount of credit paid to the OMA customer. Reducing the selling price decreases both the amount of money needed in customers' OMA accounts and the cash balance required in the AWCF.

Under the current policy and under Alternative 4 (Interim policy), an OMA customer pays the full price (LAC plus surcharge) for a requisition, and must wait to receive a credit for the return of a matching unserviceable. Under dual pricing (Alternatives 1 and 5), the customer pays the difference between the price and the credit for a requisition with a return, and there is no further financial transaction unless the customer fails to return the carcass within the allowed time period, in which case the customer is assessed a penalty equivalent to the credit. For example, with separate price and credit transactions, an OMA customer might purchase a $100,000 part, then return an unserviceable carcass and receive a credit of $50,000 a month later. The customer would have to have the full $100,000 available in his OMA account and could not spend the $50,000 credit until the credit transaction had closed. Under dual pricing, the customer would only need $50,000 in his OMA account to pay for a requisition with a return, and there would be no further financial transactions (except a $50,000 penalty if the carcass was not returned in time). The cash balance in the AWCF would also be lower under dual pricing, because the AWCF would be receiving $50,000 instead of $100,000, but it would not have to pay the $50,000 credit back to the customer.

The remainder of this briefing is organized around three research questions. First, we examine how financial policies affect the logistics decisions of OMA customers as well as AWCF cash flows, and discuss how our analysis identifies these effects. Second, based on the results of our analysis, we identify the best CPIPT alternative from the perspective of both the OMA customer and the AWCF. Third, we discuss how the preferred alternative could be implemented but include suggestions for an optimal price and credit policy, which is developed in the forthcoming publication *Right Price, Fair Credit: Criteria to Improve Financial Incentives for Army Logistics Decisions.*

The Appendices contain detailed additional information on the price and credit policies, data sources, OMA expenditures for each alternative, effects on AWCF repair and procurement costs, sensitivity of results of assumptions and data, and simulation model.

Price and Credit Policies Influence Materiel Flows Through OMA Customer Behavior

Maintain readiness

Use installation repair

OMA $

AWCF

Make local purchases

Adjust local inventories

Redistribute parts
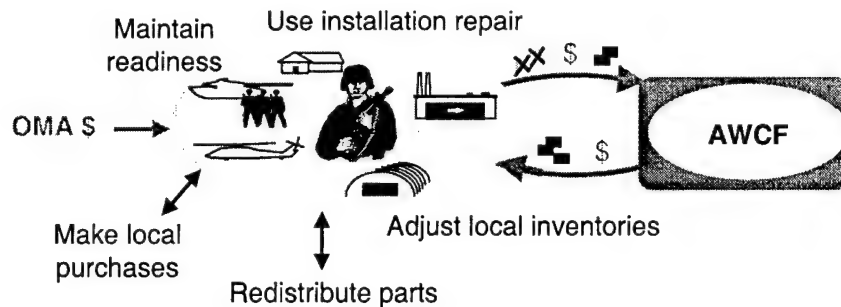
- **If prices increase, customers likely to buy fewer items**
- **If credits decrease, customers likely to return fewer items**

As discussed above, OMA customers receive funds to buy spare parts and repairs as part of a broader OMA budget that has an overall objective of maintaining the readiness of troops and equipment and the quality of life for soldiers and their families. Thus, if customers can reduce purchases or increase credits from the AWCF-funded logistics system by finding alternative sources of supply or repair, they can spend these additional OMA funds on training, BASOPS, or other needs.

Many of the OMA customers' transactions with the AWCF-funded supply system are "exchanges," i.e., the purchase of a serviceable item accompanied by the return of an unserviceable item of the same type. In effect, the customer is buying a "repair" from the AWCF. For some items, customers have the capability to repair the item in the installation's repair facilities instead, and may change the types of items they repair in response to price or credit changes.

However, because of equipment changes, the need to adjust local inventories to reflect changes in demands, and other reasons, customers also make unmatched purchases, serviceable returns, and unserviceable returns. For consumables, there will only be unmatched purchases and returns, by definition. If items have commercial equivalents, OMA customers may be able to buy supplies or repairs from local vendors instead of purchasing from the AWCF. If the AWCF offers low credit for serviceable returns, customers may redistribute items between units on the same installation, through the FORSCOM Materiel Management

Center (FMMC), or between installations using a new capability that was recently added to SARSS, the Standard Army Retail Supply System.

When OMA customers have alternative sources of supply and repair and other pressing demands on their OMA budgets, they are likely to change their behavior in response to changes in prices and credits offered by the AWCF. Generally speaking, when the price of a particular item goes up, customers are likely to buy fewer of that item. Similarly, when the credit for an item falls, customers will return fewer of that item.[26]

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[26]For a discussion of how Air Force customers have responded to the price and credit policy used in the Air Force Working Capital Fund, see Laura H. Baldwin and Glenn A. Gotz, *Transfer Pricing for Air Force Depot-Level Reparables*, Santa Monica, CA: RAND, MR-808-AF, 1998. This document also has an excellent review of the economics and accounting literature on internal transfer prices.

Materiel Flows Affect AWCF Inventory Replenishment Costs
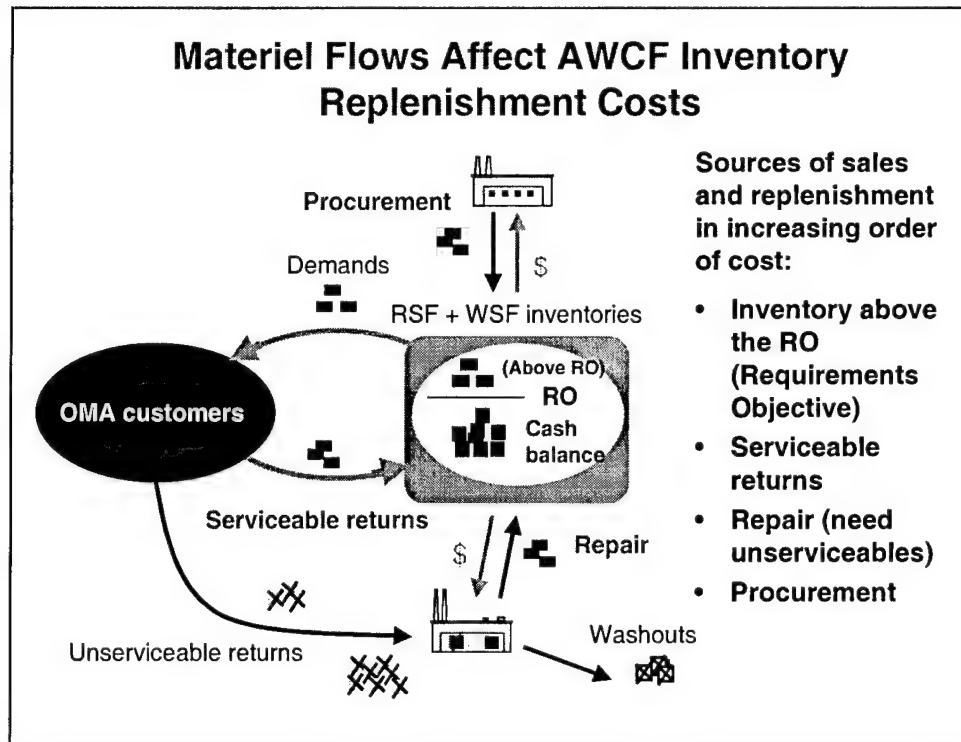
The alternative price and credit policies must also be evaluated from the perspective of the AWCF. The AWCF begins the fiscal year with an inventory of serviceable and unserviceable assets for each National Stock Number (NSN) and a cash balance. To model the first phase of SSF, we combined the inventories currently held by the WSF and RSF on each installation, and also added together the desired inventory levels, or Requirements Objectives (ROs).[27]

Based on demands, serviceable returns, and unserviceable returns from OMA customers, as well as the starting inventory, the AWCF will have to replenish its inventories. Using up inventories above the RO is the least expensive source of sales, since these inventories do not need to be replenished. Next, the AWCF can resell serviceable returns at a very low net cost to the Army. Third, the AWCF can repair unserviceable assets until it runs out of carcasses. Finally, its most expensive source of replenishment is procurement.

Cash flows to and from OMA customers in the form of sales and credits, together with replenishment costs, determine the net operating result and the cash balance of the AWCF.[28]

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[27]In practice, the Army will probably want to adjust ROs to reflect the better asset visibility that will be available as a result of SSF.

[28]Our analysis estimates only total annual cash flows, rather than weekly or monthly cash balances in the AWCF. Additional data would be required to estimate real-time cash balances, because demands would have to be matched with unserviceable returns under the alternatives using dual pricing.

Price and Credit Policy Determines
Materiel Flows and Replenishment Costs

Price and credit policy		OMA budget		OMA customer behavior		AWCF replenishment costs

- Current
- Alternatives

- Demands
- Returns
- Redistribution
- Local repair
- Local purchase

- Inventory above the RO
- Serviceable returns
- Repair
- Procurement
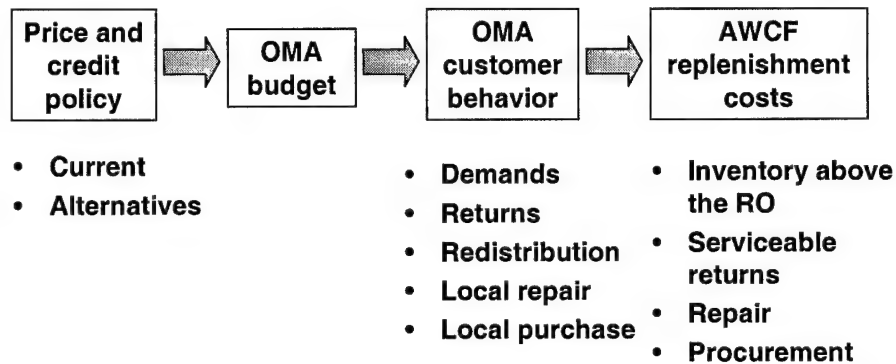
To summarize, price and credit policies, together with the OMA budget, influence the behavior of the OMA customer. The OMA customer's decisions about when to make demands and returns to the AWCF-funded supply system, and when to use OMA redistribution channels, local repair, and local purchase, determine the materiel flows seen by the AWCF. The AWCF's starting inventory and materiel flows to and from OMA customers then determine the AWCF's repair and procurement costs.

Army Data Was Used to Quantitatively Evaluate OMA Costs and AWCF Replenishment Costs

- **OMA costs**
  - Used one year of requisitions and returns (OMA-AWCF transactions)
  - Applied price and credit policy

OMA cost = price * # requisitions – credit * # returns

- **AWCF replenishment costs**
  - Asset balance files show serviceable and unserviceable assets
  - Returns from customers are added to serviceable and unserviceable inventories
  - Requisitions to OMA customers are filled from (in order of preference)
    1. serviceable inventory if available
    2. repair of unserviceable inventory if available
    3. purchase
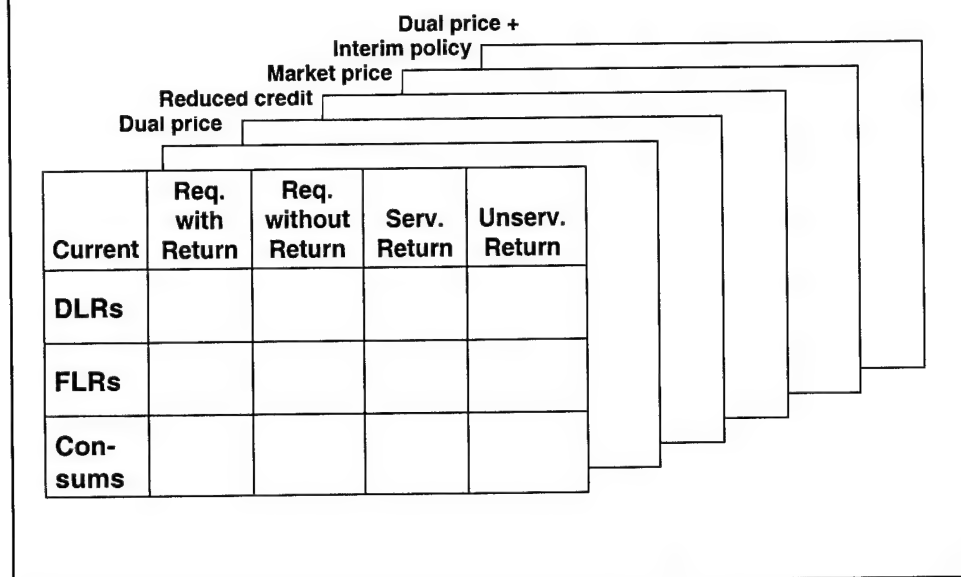 - Ending inventory was the same for each alternative

AWCF repl. cost = LAC * # purchased + repair cost * # repaired

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Ideally, each of the alternative price and credit policies should be evaluated quantitatively based on its effects on unit readiness, parts redistribution, local purchases, local inventory, installation repair, etc. However, with available Army data, it was only possible to calculate the required OMA funding levels and the AWCF stockage replenishment costs.

To calculate the required OMA funding levels, we used one year (FY98) of actual requisitions and returns recorded in the Army's supply system—OMA to AWCF transactions. For each alternative, the OMA cost was the sum across all NSNs of the price of the requisitioned NSN multiplied by the total number of requisitions for that NSN minus the credit for the returned NSNs multiplied by the total number of returned items.

The details of calculating the AWCF replenishment costs are a bit more complicated because they require calculating inventory levels and then the quantity of NSNs to be purchased or repaired. These details are fully described in the following pages. However, once the quantities have been determined, the formula for calculating the AWCF replenishment cost is very straightforward. Like the OMA costs, these costs are summed across all NSNs. For each NSN the cost was equal to the LAC multiplied by the quantity of that NSN that would have been purchased plus the repair cost times the quantity of that NSN that would have been repaired.

We Calculated the Net OMA Cost of Transactions Under Each Alternative

Dual price +
Interim policy
Market price
Reduced credit
Dual price

| Current	Req. with Return	Req. without Return	Serv. Return	Unserv. Return
DLRs				
FLRs				
Con-sums				

For our analysis, we divided OMA-AWCF transactions into four categories: requisitions with matching unserviceable returns, requisitions without matching returns, serviceable returns, and unserviceable returns without a matching requisition. We also divided NSNs into three categories: DLRs, FLRs,[29] and consumables. (Some category/item combinations are empty, e.g., there are no requisitions with matching unserviceable returns for consumables.)

Using SARSS issues and receipts records, we determined the quantities of demands and returns in each of the four categories for each NSN. We then evaluated the resulting sales and returns under the current price and credit policy and each of the five alternatives. This gives us the total net OMA cost of each alternative.

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[29]Under SSF's National Maintenance Management concept, item managers will determine which NSNs are repaired in installation-level GS repair facilities (FLRs) and which NSNs are repaired at the wholesale level (DLRs). To model this policy, we classified NSNs that are currently repaired in installation-level GS facilities as FLRs, even though some of them are currently coded as DLRs or consumables based on their Materiel Recovery Code (MRC) in the Army Master Data File (AMDF).

We Simulated Materiel Flows and Calculated AWCF Replenishment Costs for Each Alternative
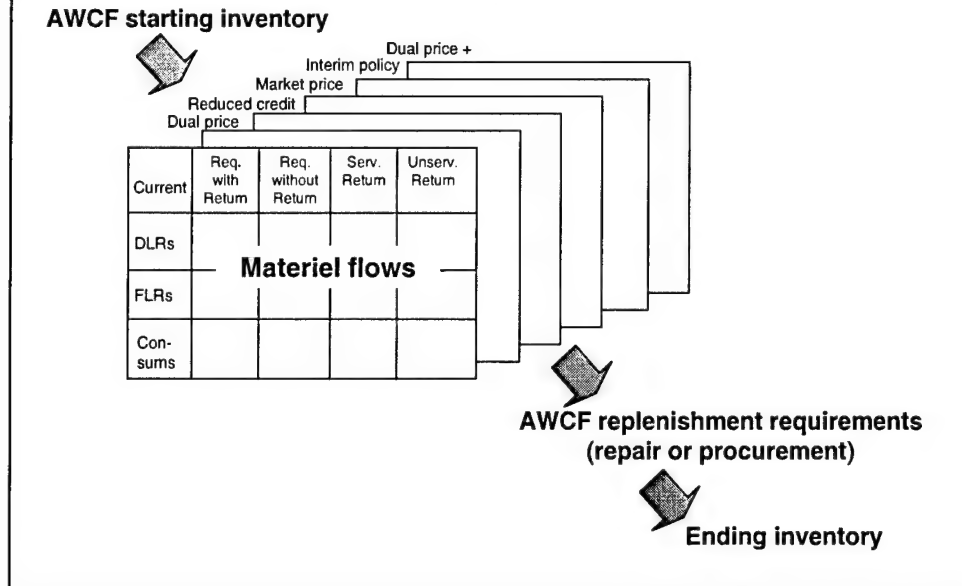
To calculate the AWCF replenishment costs of each alternative, we used the September 1997 Budget Stratification as the AWCF starting inventory. We subtracted demands and added serviceable returns to the serviceable inventory, and added unserviceable returns to the unserviceable inventory of each NSN under each alternative. We calculated AWCF replenishment costs by first selling inventory above the RO without replacement, then reselling serviceable returns, then repairing unserviceable assets, and finally procuring (after unserviceable carcasses were exhausted).

To compare the alternatives fairly, we required each alternative to reach the same ending inventory of serviceable assets. For each NSN, the ending inventory had to be equal to the starting inventory or the RO, whichever was lower. We used this conservative replenishment policy because some of the ROs were very high relative to the starting serviceable inventories, and it would have been unrealistically expensive to replenish up to these ROs. We also analyzed a more aggressive replenishment policy, but it did not change the ranking of the alternatives (see Appendix D).

Cautions on Interpretations of Data and Analysis

- **Using supply data for transactions, not financial data**
- **Data from 11 CTASC sites does not represent all demands**
    - **Missing most TRADOC transactions**
    - **Missing local purchase, credit card transactions, DLA Electronic Mall**
    - **Doesn't include National Guard**
- **Definition of FLRs**
- **Uncertainty with which past behavior predicts future behavior**
- **No data or analysis on AWCF cash flows/balance**
- **Inventory limited to WSF and RSF assets**

The analysis reported in this document is indicative of the types of changes in OMA customer behavior, OMA budgets, and AWCF inventory replenishment costs that might occur as a result of changes in price and credit policies. (Appendix H describes the simulation model used in the analysis.) However, our results should not be interpreted as total estimates of future OMA and AWCF expenditures, because of a number of shortcomings in the data[30] and resulting limitations on the analysis.

First, our analysis is based on transactions observed in automated supply systems rather than in financial systems. There are a number of reasons why the total number of supply transactions reported in SARSS differs from the total number of financial transactions reported by the RSF. The eleven SARSS CTASC (Corps/Theater ADP Service Center) sites used for our analysis do not represent total Army-wide demands and returns, because many TRADOC installations had converted to SARSS only recently and did not have a year's history of supply transactions in their CTASC records. SARSS does not record some types of financial transactions, such as local purchases, credit card transactions, and purchases from the DLA Electronic Mall Web site. National Guard transactions are not recorded in either SARSS or the RSF totals, since the National Guard has not yet converted to SARSS, and it transacts directly with the WSF. Since the

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[30]Appendix B describes the data used in the analysis.

inventory records from the FY97 Budget Stratification and SARSS ABFs (Asset Balance Files) are likely to be more comprehensive than the supply transaction data, and since we use the least expensive sources of inventory replenishment first, AWCF replenishment costs would be likely to increase more than proportionately if demands were more representative of Army-wide totals.

Second, we define FLRs based on what is currently being repaired in installation RX programs. Some of these items are currently coded as either DLRs[31] or consumables in the AMDF. Under Single Stock Fund, item managers will have greater visibility of the relative costs of repair at the wholesale and installation levels, and they may redefine which items are DLRs, FLRs, and consumables. Any changes in costs or reliability resulting from changes in repair policy cannot be captured by our analysis.

Third, the supply transactions used for the analysis represent a "snapshot" of OMA customer demands and returns. As equipment densities, OPTEMPO rates, and customer behavior change over time, this set of demands and returns becomes less representative of future demands and returns. In particular, we test a variety of assumptions about aggregate changes in customer behavior, but we cannot predict changes in customer behavior on an item-by-item basis, which would be needed for an accurate forecast of OMA budgets and AWCF replenishment costs.

Fourth, our analysis estimates OMA expenditures and AWCF inventory replenishment costs on the basis of total annual transactions. A much more detailed, time-based analysis would be needed to examine AWCF cash flows and cash balances on a monthly or weekly basis. A time-based analysis would require additional data on the timing of OMA purchases and returns and AWCF repair, procurement, and operating costs, and the ability to match purchases and subsequent returns from the same customers to evaluate the alternatives that incorporate dual pricing.

Finally, we combine WSF and RSF assets and ROs for this analysis. This represents most of the first stage of implementation of SSF.[32] When these inventories have been combined, the Army is likely to want to adjust SSF ROs and to redefine which items are in long supply relative to combined WSF and RSF inventories, demands, and returns. In future stages, the assets in Authorized Stockage Lists (ASLs) will also be incorporated into SSF, resulting in a different point of sale, a different set of relevant demands and returns, and a more comprehensive inventory included in SSF.

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[31]Installations are permitted to perform certain GS-level repair tasks on items coded as DLRs if they have the capability and the capacity to do so.

[32]After this analysis was completed, the Army decided to combine Milestones 1 and 2 of its SSF plan, so that both RSF inventories (Milestone 1) and OMA-funded retention inventories (Milestone 2) would be included in the first stage of implementation.

Our Analysis Accounts for Assumptions About Customer Behavior

- **No sensitivity to price and credit changes (demands and returns constant under each alternative, elasticity of 0)**
- **Moderate sensitivity to price and credit changes (elasticity of 1.0)**
- **Computational experiment explored: influence of elasticity, impact of scaling, effects of demand stream**

P=1230, Q=12

% change in P

% change in Q   P=128, Q=96

Price

Quantity
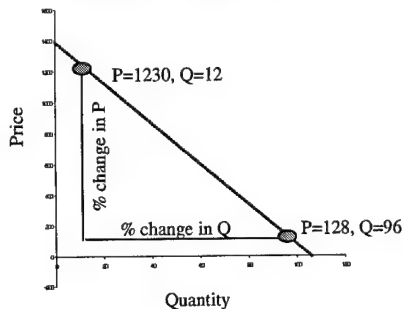
- **Elasticity is defined as:**
  % change in Q
  % change in P

- **This item is an altimeter-encoder from the RPI list**

- **It had an elasticity of .96**

Economists use price elasticities to measure changes in demand that result from changes in price. Elasticity is defined as the percentage change in quantity demanded divided by the percentage change in price. (For example, if the quantity demanded falls by 10 percent when the price increases by 10 percent, the elasticity is 1.0.) We calculated net OMA costs under two different assumptions about OMA customer behavior.

First, we assumed that customers have no sensitivity to price and credit changes, i.e., quantities purchased and returned remained the same as the baseline under all the alternatives. This corresponds to a price elasticity of zero.

Second, we assumed that customers have a moderate response to price and credit changes, e.g., quantities purchased increase if prices fall, and quantities returned decrease if credits fall. We estimated a "moderate" response by analyzing observed elasticities for a sample of items on the reduced price initiative (RPI) list.[33] For these items we calculated an average elasticity of 1.8

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[33]In 1995 the Army implemented the reduced price initiative in an effort to reduce wholesale assets. An NSN is put on the RPI list if it is in "long supply," meaning that the Army has more of this NSN than it is likely to be able to use. Initially there were fewer than 200 NSNs on the RPI list. The reduced price for these NSNs was the surcharge value. By FY99 there were over 1,200 NSNs on the list, but the price had increased to 50 percent of the AMDF price. (Note: the AMDF price equals the LAC plus the surcharge.) See *Right Price, Fair Credit: Criteria to Improve Financial Incentives for Army Logistics Decisions,* RAND, MR-1150-A, forthcoming.

and a median elasticity of 0.31. As an example, consider an item that was on the Army's RPI list: an altimeter-encoder managed by AMCOM and used on aviation ground systems. During the year before they went onto the RPI list, 12 of these parts were sold at a cost of $1,230 each. After a year on the RPI, 96 of the parts had been sold at a cost of $128 each. The elasticity for this part is 0.96.

To model behavioral changes, we used a price elasticity of 1.0, but we did not allow purchases or returns to increase by more than double or to fall by more than half, except for returns, which could fall to zero. In the commercial sector, only necessities such as water and electricity have price elasticities less than 1. However, even items with inelastic demands (elasticity < 1) can experience substantial quantity changes, as the example in the chart indicates. Brand-name products typically have elasticities of 2.5 to 3.

To test the robustness of our results, we varied our assumptions along three dimensions as a computational experiment. We tested four different assumptions about elasticities of demand, three levels of scaling the total dollar value of demands from supply system totals to financial system totals, and two randomizations of the stream of demands and returns.[34] In each case, the direction of change between the alternatives remained the same, and the ranking of the alternatives did not change. The results of the computational experiment are described in Appendix F.

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[34]Since there is some disagreement about the actual elasticity of demand for spare parts, and there is not sufficient data to estimate elasticities on an item-by-item basis, we varied our elasticity assumptions as part of our sensitivity analysis. Our variations of the elasticity assumption included an elasticity of 0.5 for all items, a randomly assigned elasticity ranging between 0 and 2 for each item, and an elasticity of 0 for all items with an essentiality code of C (meaning that the item is "essential"). We scaled demands and returns observed in the CTASC data up to the midpoint between the CTASC and RSF total dollar values, and up to the RSF total dollar value.

Research Questions and Findings

Research Question	Finding
• How should quantitative criteria be evaluated?	• Measure changes in OMA budgets, including potential behavior changes, and AWCF inventory replenishment costs
• Which CPIPT alternatives perform best?	
– OMA impacts	
– AWCF impacts	
• How should the chosen CPIPT alternative be implemented?	

The second section of the briefing shows the results of our analysis. We find that Dual price+ is preferred from both the OMA and AWCF perspectives. First, we show the results of our OMA analysis, which indicate that less OMA funding is needed under Dual price+ if customers demand and return the same quantities of items as in the baseline case. If customers change their behavior in response to price changes, they will demand and return more items, and total OMA costs will fall further. Our analysis of OMA expenditures is described in greater detail in Appendix C.

Dual Price+ Requires a Smaller OMA Budget for the Same Demands and Returns

elasticity = 0

* Surcharge is built into other prices, as is current Army practice

Current	Dual price	Reduced credit	Market price	Interim policy	Dual price +
1,668	1,869	1,352	1,534 (+419 surcharge = 1,953)	1,656	1,204

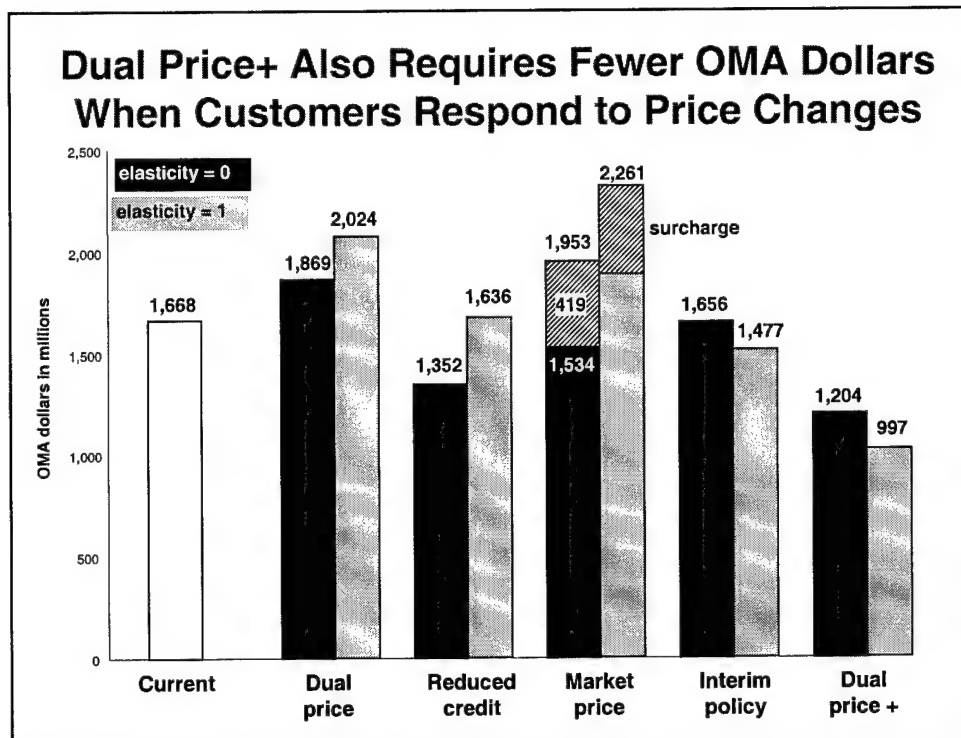All items—DLR, FLR, consumables; all sources of supply
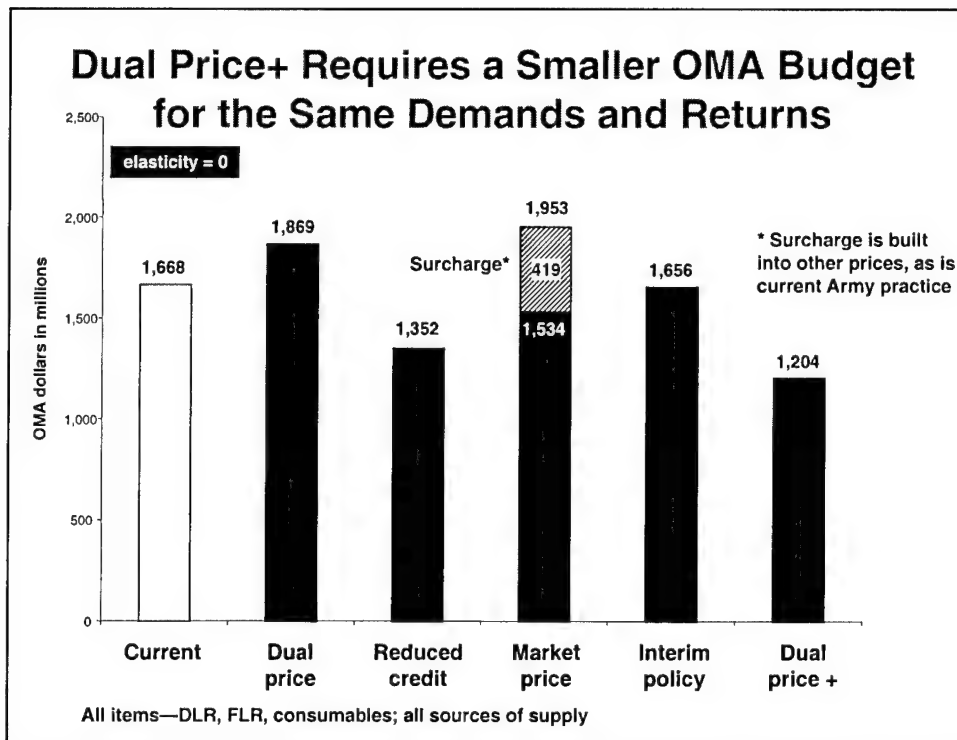
This chart shows the net OMA budget (prices net of credits in millions) required to fund the actual purchases and returns seen in our data (assuming no change in customer behavior). It shows the cost of supply transactions for all types of items—DLRs, FLRs, and consumables—and for all sources of supply. For the CTASC transactions in our data, the current price and credit policy requires $1.7 billion compared to $1.2 billion for Dual price+.

Since Market price separates the surcharge from the price and credit, the amount of surcharge costs that would need to be directly funded must be added to the cost of the purchases and returns. The current policy and the other alternatives (Dual price, Reduced credit, Interim policy, Dual price+) incorporate the surcharge into the price of the item.

Reduced credit and Dual price+ require less than the current level of OMA funding because the price of a requisition with a return is lower than under current policy, particularly for FLRs. Because Dual price and Market price do not give credit for unmatched returns, they require more total funding—Dual price would increase OMA funding, and Market price would require direct funding of the surcharge, which when combined with OMA funding would be higher than the current level. The level of OMA funding for Interim policy is similar to current funding, because it simply takes the averaging out of the current credit policy.

The next chart will examine the differences among the alternatives if OMA customers respond to changes in price and credits.

Dual Price+ Also Requires Fewer OMA Dollars When Customers Respond to Price Changes

OMA dollars in millions

elasticity = 0
elasticity = 1

	Current	Dual price	Reduced credit	Market price	Interim policy	Dual price +
elasticity = 0	1,668	1,869	1,352	1,534 / 419 (1,953)	1,656	1,204
elasticity = 1		2,024	1,636	2,261 (surcharge)	1,477	997

The more OMA customers respond to price and credit changes, the fewer OMA dollars are required under Dual price+. The left-hand (darker) bar for each alternative shows the same results that were on the previous chart. The right-hand (lighter) bar shows the effects of customer responses to price and credit changes using an elasticity of 1. Note that Dual price, Reduced credit, and Market price become more expensive if customers' behavior responds to new prices and credits. Interim policy and Dual price+ require less OMA when accounting for behavioral changes than they required using historical requisitions and returns.

For purchases, the effects of behavior changes tend to be offsetting. For example, if the price of an item goes up, purchases will fall, so the change in the height of the bar (price times quantity) depends on whether the higher price or the lower quantity dominates. For returns, the effects of behavior changes are unambiguous. When credits go up, returns also go up, so customers need less OMA. The opposite happens when credits fall.
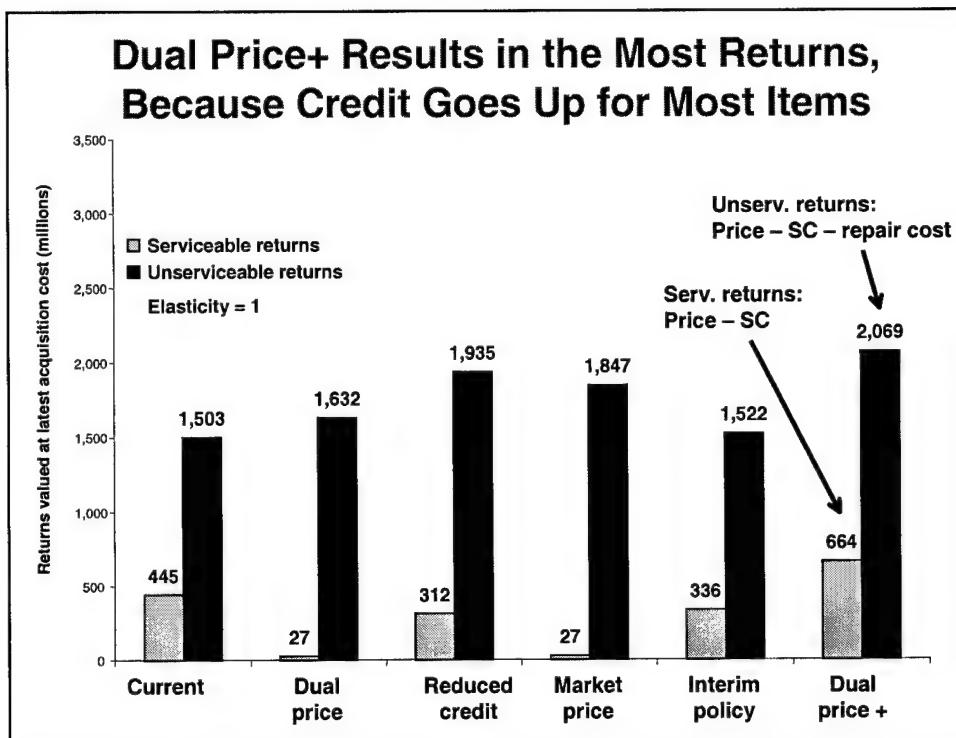
The OMA budgets required for Dual price and Market price only reflect changes in purchases, because OMA customers get no credit for unmatched returns, with or without quantity changes. Reduced credit, Interim policy, and Dual price+

reflect the combined effects on purchases and returns.[35] Under Reduced credit, the lower credit for unmatched returns (serviceable returns and unserviceable returns without a requisition) causes returns to decrease, which tends to increase total OMA expenditures. Under Interim policy and Dual price+, higher credit for unmatched returns causes returns to increase, resulting in lower total OMA expenditures.

The purpose of comparing the results with changes in customer behavior (i.e., with an elasticity of one) to actual demands and returns is to show the direction of the impact on OMA funding. Thus Dual price and Market price, which were the most expensive (required the most OMA funding) without quantity changes, become even more expensive if customer behavior changes, and Interim policy and Dual price+ become less expensive.

The next two charts provide more information on the effects of changes in customer behavior by showing what happens to the quantities purchased and returned under each alternative.

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[35]We apply the elasticities separately to each type of transaction (requisitions with returns, requisitions without returns, unmatched serviceable returns, and unmatched unserviceable returns), because we cannot measure the number of potential returns available in local inventory. In practice, customer behavior could be linked across transaction types. For example, under Dual price, customers might set up "retention facilities" for unmatched unserviceable returns to match with requisitions without returns from other units to reduce total OMA outflows.

Dual Price+ Results in the Most Returns, Because Credit Goes Up for Most Items

Returns valued at latest acquisition cost (millions)

- ☐ Serviceable returns
- ■ Unserviceable returns

Elasticity = 1

Unserv. returns:
Price – SC – repair cost

Serv. returns:
Price – SC

Category	Serviceable	Unserviceable
Current	445	1,503
Dual price	27	1,632
Reduced credit	312	1,935
Market price	27	1,847
Interim policy	336	1,522
Dual price +	664	2,069

For most items, customers receive more credit for returns under Dual price+ than under the current policy. Thus, customers respond by returning more items—both serviceable and unserviceable.[36]

For each of the alternatives, changes in unserviceable returns reflect changes in both the net price for a requisition with a matching unserviceable return and the credit for unmatched unserviceable returns. As a result, the quantity of unserviceable returns goes up under Dual price and Market price even though they offer no credit for unmatched unserviceable returns, because the net price of a requisition with an unserviceable return goes down, particularly for FLRs. Changes in serviceable returns reflect changes in the credit for unmatched serviceable returns.

Note that Reduced credit, which lowered credits and prices in parallel, has fewer serviceable returns than under current policy, because the average credit for serviceable returns is lower. Since the net price for requisitions with returns is lower than under current policy, unserviceable items are returned in larger numbers than under current policy. However, the lower credit for unmatched

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[36]In this chart, returns are evaluated at Latest Acquisition Cost (LAC) rather than actual credits received, to show the differences in quantities, holding the value of the item constant. The actual amount of credit received under each alternative combines the effects of credit changes and quantity changes.

unserviceable returns causes the total unserviceable returns to be slightly lower under Reduced credit than under Dual price+.

Interim policy has fewer serviceable returns than Dual price+, primarily because it offers no credit for serviceable consumable returns. It has fewer unserviceable returns because it bases credit for unserviceable FLRs on wholesale repair costs, which are generally higher than installation-level repair costs.

Under Dual Price+, Customers Pay Less on Average for Requisitions with Returns, So Demands Rise
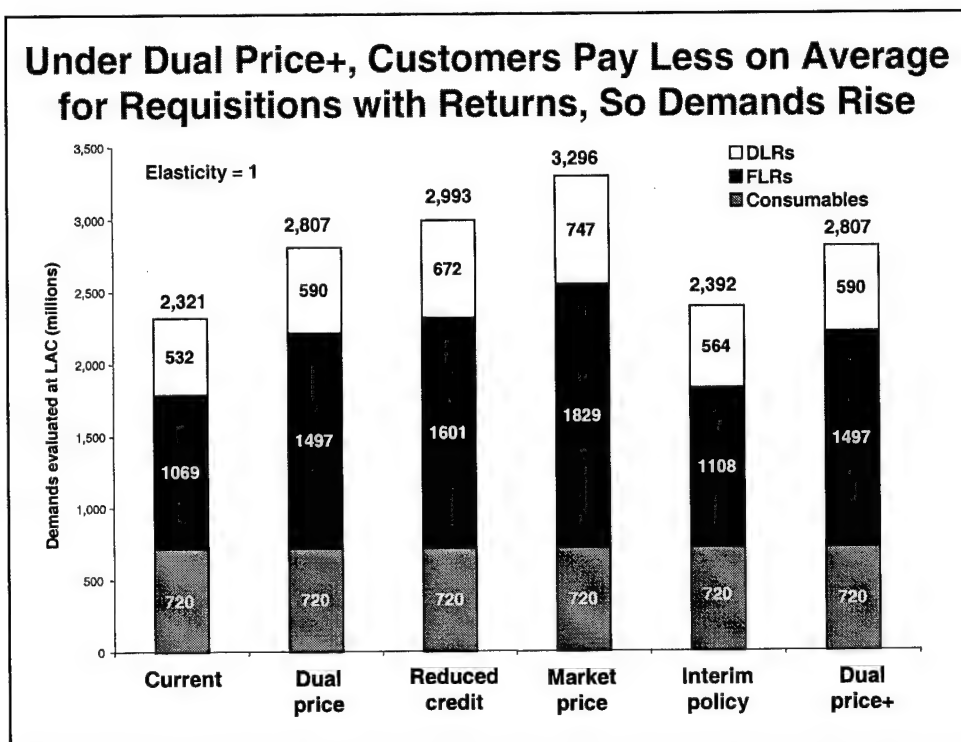
Under Dual price and Dual price+, customers pay the repair cost plus the surcharge for a requisition with a return. For most items, this is less than what customers currently pay, which is the price minus the RSF credit. Because the net price is lower under Dual price and Dual price+, demands for DLRs and FLRs increase. Reduced credit and Market price result in a further lowering of prices for requisitions with and without returns (below both current policy and dual pricing [Alternatives 1, 2, and 5]), generating even higher total demands.

A key difference among the alternatives is the pricing of FLRs. All the alternatives except Interim policy give credit (or set net prices) for FLRs based on the installation-level repair cost, which is generally lower than the wholesale repair cost—lower repair costs result in a higher credit rate. Because Interim policy gives credit based on the wholesale repair cost for both DLRs and FLRs, FLR requisitions with returns are more expensive and hence the demand is lower under Interim policy than the other alternatives.

The demand for consumable items is the same for all the alternatives because they all charge the current price for consumable requisitions.

Next, we will show that Dual price+ is preferred from the AWCF perspective because it results in the lowest inventory replenishment costs. As discussed above, setting prices and credits based on actual wholesale repair and replacement costs will encourage OMA customers to purchase more items from AWCF inventories and to return more serviceable and unserviceable items. As a result, more transactions stay within the AWCF, AWCF inventories and repair facilities are more fully utilized, and the AWCF is better able to recover its costs.

Because Dual price+ offers higher credits for serviceable returns, it will also allow the installations to adjust their local inventories without undue penalty. There will be less financial incentive to redistribute parts outside the supply system and to make local purchases, because prices and credits are set to reflect actual wholesale costs to the Army.

Dual price+ has lower replenishment costs because there are more serviceable returns to resell and more unserviceable returns to repair, offsetting the need for procurement.

Our analysis of AWCF repair and procurement costs is described in greater detail in Appendix D.

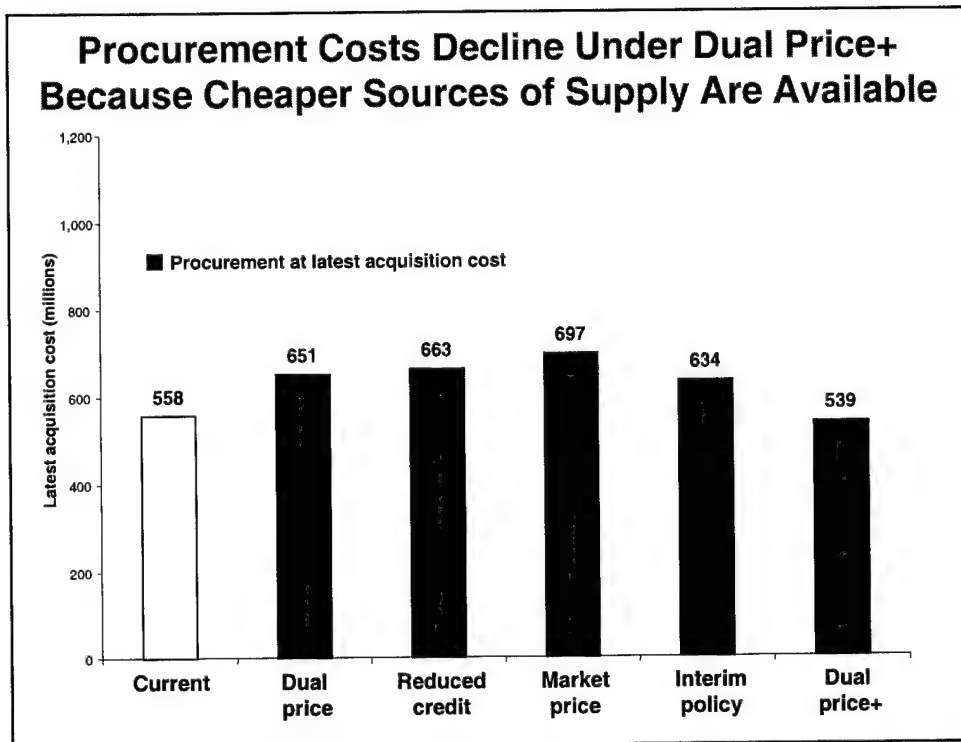## AWCF Repair and Procurement Costs Increase Under Most Alternatives
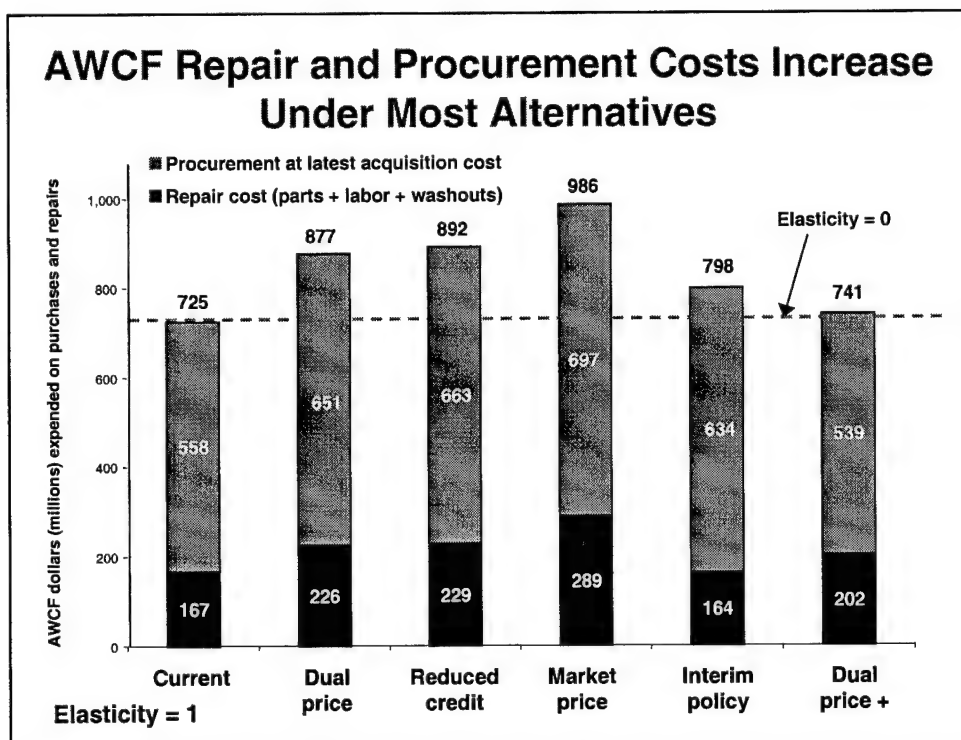
This chart shows the effects of the alternative price and credit policies on AWCF repair and procurement costs. If we use historical demands and returns (no customer response to price and credit policy changes), there is no change in the AWCF repair and procurement costs (dashed line) because all the alternatives replenish to the same ending inventory.[37] When we assume that customers respond to price and credit changes (elasticity = 1), Dual price+ requires only slightly more AWCF dollars for replenishment than the present policy, even though total demands are higher than under current policy, as we showed above on page 31.

Each of the other alternatives requires significantly more AWCF funds to replenish inventories. Recall from page 29 that the first four alternatives had fewer serviceable returns than both the current policy and Dual price+. Also, the first four alternatives had fewer unserviceable returns than Dual price+. Lack of serviceable returns to resell results in higher repair or procurement costs, and lack of unserviceable returns results in higher procurement costs when there are no remaining carcasses to repair.

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[37] In the analysis, we replenished the inventory to the smaller of the on-hand serviceable inventory or the RO. This conservative replenishment rule was chosen because when the wholesale and retail ROs were added together, some NSNs had very high ROs relative to actual stocks on hand. The relative ranking of the alternatives did not change when we used a more aggressive replenishment rule.

Dual Price+ Can Meet Higher Demands at Lower Replenishment Cost per Demand
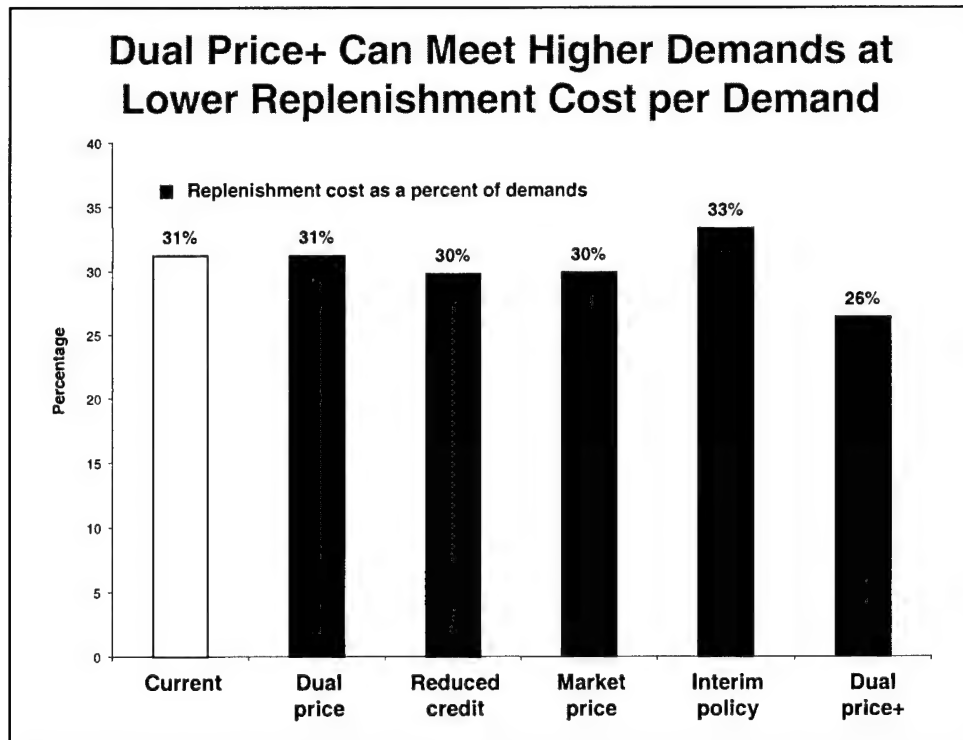
This chart summarizes the capability of Dual price+ to meet higher demands at a lower replenishment cost when customers respond to price and credit changes. It shows inventory replenishment costs (from page 33) as a percentage of demands evaluated at LAC (from page 31), assuming an elasticity of one. For Dual price+, replenishment costs are only 26 percent of demands because of higher return rates for both serviceables and unserviceables. Each of the other alternatives had replenishment costs of 30 percent or more as a percentage of demands. Demands increase under Dual price, Reduced credit, and Market price, but replenishment costs go up in roughly the same proportion, because serviceable and unserviceable returns are lower than under Dual price+. Interim policy results in roughly the same demands as the current policy, but replenishment costs go up because it gives no credit for consumable returns.

Procurement Costs Decline Under Dual Price+ Because Cheaper Sources of Supply Are Available

Chart: Bar chart titled with y-axis "Latest acquisition cost (millions)" ranging from 0 to 1,200.

Legend: ■ Procurement at latest acquisition cost

| Category	Value
Current	558
Dual price	651
Reduced credit	663
Market price	697
Interim policy	634
Dual price+	539

Procurement costs are the lowest for Dual price+ because it gives the most credit for serviceable and unserviceable returns. The net result of giving more credit is that more of the Army's serviceable inventory is available to satisfy demands, and more unserviceable inventory is available for repair.

Compared to Current Policy and Interim Policy, Dual Price+ Meets More Demands with Repair
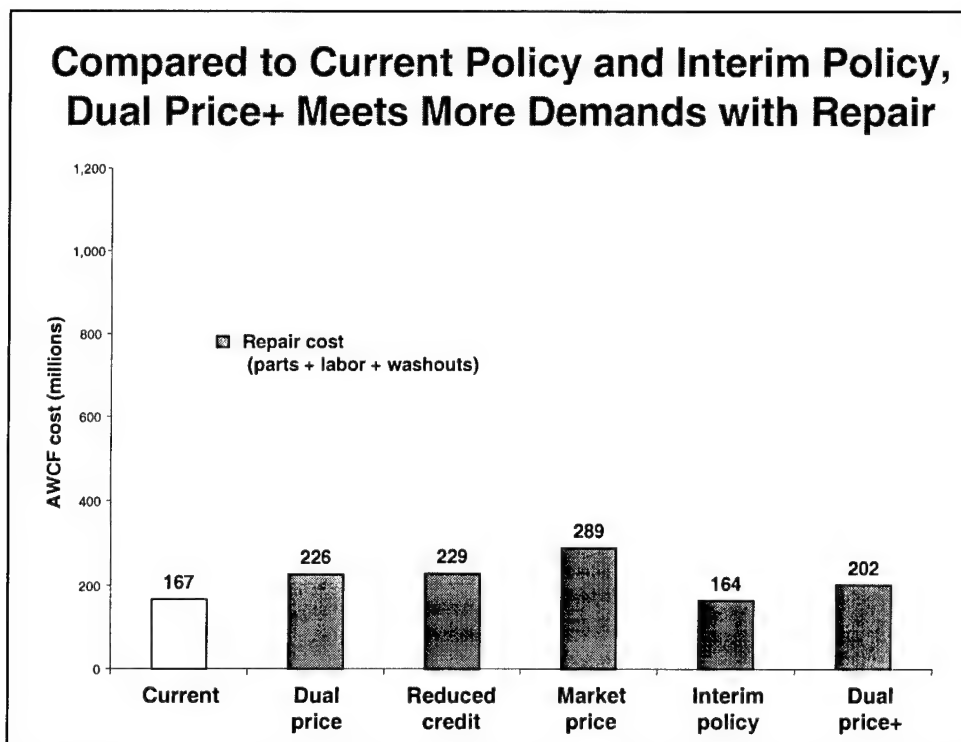
The AWCF's use of repair as a source of inventory replenishment depends on total demands, the availability of unserviceable carcasses to repair, and the availability of less expensive sources of sales, such as inventory above the RO and serviceable returns. All alternatives except Interim policy result in higher demands than the current policy, and thus in higher total repair costs. Dual price and Dual price+ generate the same total demands (see page 31), but repair costs are lower under Dual price+ because more serviceable returns are available to resell. Dual price+ results in greater use of repair than both current policy and Interim policy because it is meeting higher demands, and because more unserviceable carcasses are available for repair, offsetting procurement costs.

Compared to Current Policy and Interim Policy, Dual Price+ Uses More Inventory Above the RO
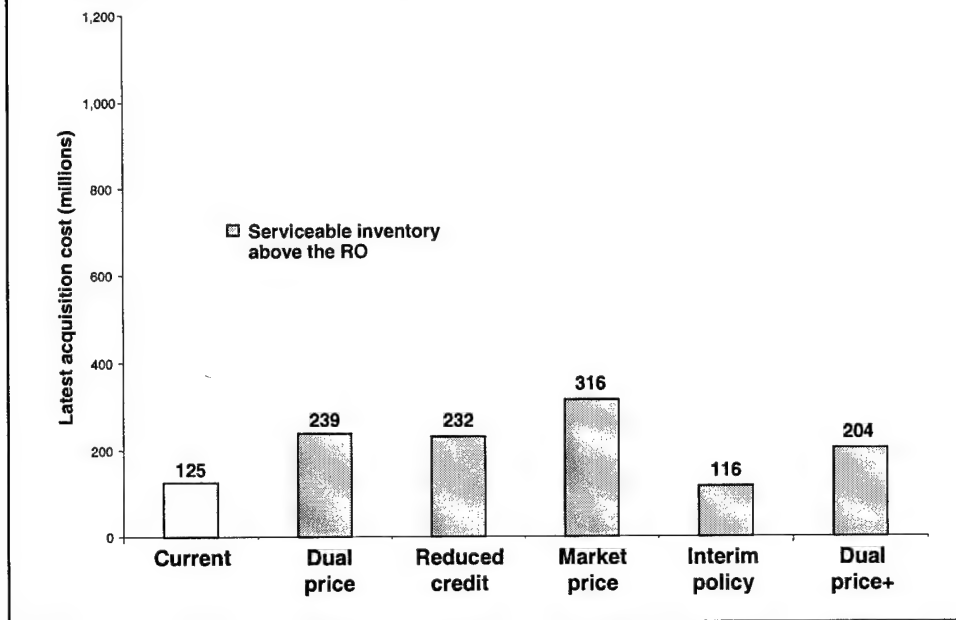
Using serviceable inventory above the RO to meet demands lowers replenishment costs, because the Army does not need to repair or procure these items until the surplus is drawn down. Dual price+ uses more serviceable inventory above the RO to meet demands than does the current policy and Interim policy.[38] Dual price, Reduced credit, and Market price also use more serviceable inventory above the RO, but this positive effect is offset by decreased serviceable and unserviceable returns.

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[38]Primarily, this difference is caused by higher demands for FLRs. All the alternatives except Market price charge a lower net price (or price minus credit) for FLR requisitions with returns, because they link the credit for an FLR to the installation-level repair cost. As discussed earlier, current policy and Interim policy generally set higher net prices for FLR requisitions with returns.

Under Dual Price+, More Serviceable Returns Are Available to Meet Demands
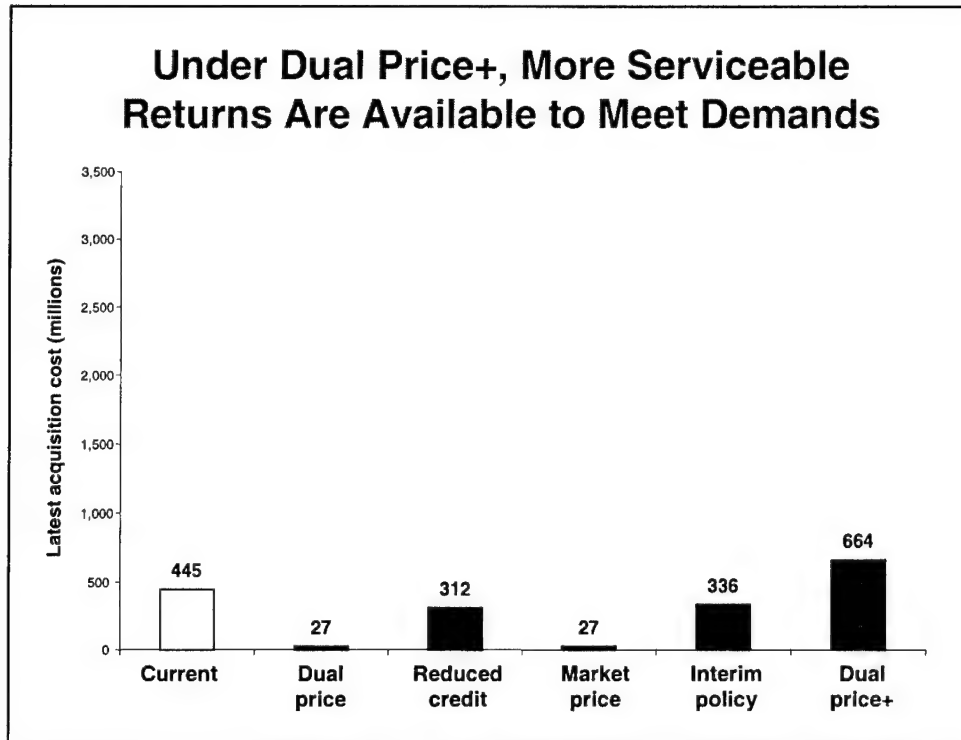
This chart shows the effect of price and credit policies on serviceable returns. Because Dual price+ gives a credit of price minus the surcharge for serviceable DLR and FLR returns and for consumable returns valued at more than $50, more serviceable returns are available to satisfy demands under this alternative. Dual price and Market price give no credit, resulting in a virtual disappearance of serviceable returns. Reduced credit and Interim policy give less credit for serviceable returns than does the current policy; thus they have lower serviceable return rates.

When serviceable returns are available to fill demands, the Army does not have to incur either repair or procurement costs.

A Good Price and Credit Policy Will Keep Materiel Flowing Between AWCF and OMA
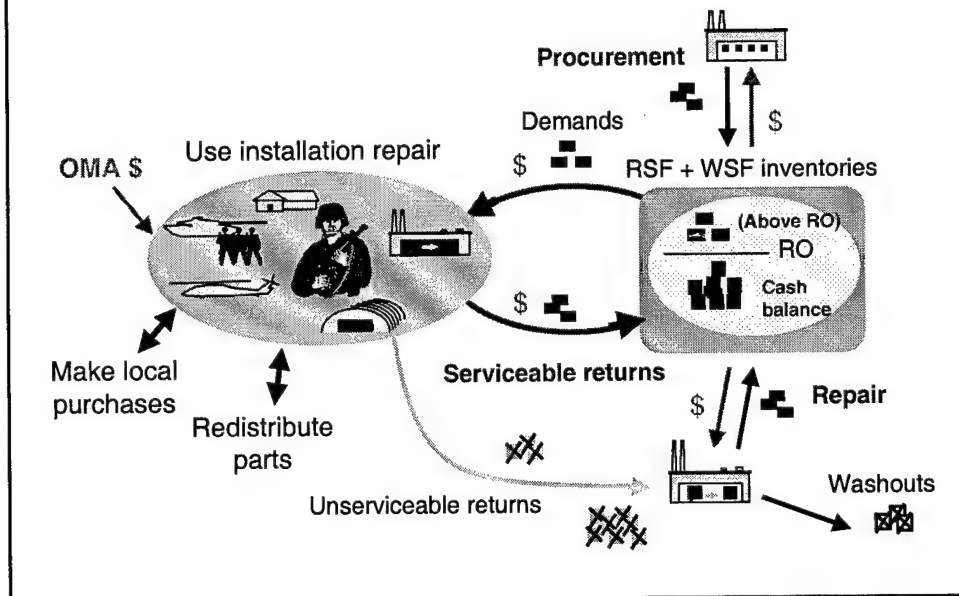
To summarize the advantages of Dual price+, a good price and credit policy should keep materiel flowing between AWCF and OMA, by reducing the financial incentive for customers to set up alternative supply, repair, and redistribution channels. This cycling of materiel between the AWCF and the OMA customer will be beneficial for both customers and suppliers, because it keeps transactions within the supply system as it was designed to operate, and maintains the financial health of the wholesale supply system.

Because prices and credits to OMA customers under Dual price+ are more in line with actual costs to the Army, (e.g., the price of a requisition with a return is the cost to repair the item), the AWCF will become a more attractive source of supply and repair from the customer's perspective. As a result, sales from the AWCF are likely to replace many of the current "work-arounds" such as the use of OMA-funded retention facilities to redistribute assets outside the AWCF, and customers will perform local repairs only when they are actually less expensive than wholesale repairs.[39]

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[39]Under current policy, OMA customers receive only 5–15 percent credit for consumables if the item is not needed locally. Thus, they can save 85–95 percent of the purchase price if they can redistribute the item through an OMA-funded retention facility. Under Dual price+, the credit would be approximately 80 percent of the purchase price, so the savings from redistribution would be only about 20 percent of the purchase price, which is less likely to cover the costs of establishing alternative redistribution systems.

The AWCF benefits under Dual price+ because it can more frequently use the inventory above the RO to fill customer demands. More serviceable returns are available to meet customer demands and more unserviceable returns are available to repair, offsetting procurement costs. However, as inventories are adjusted and more reasonably sized to demands, there will be fewer serviceable assets above the RO to fill customer demands.

The combined effects of higher OMA demands for a given funding level and lower AWCF replenishment costs were seen in the chart on page 34—Dual price+ can fill higher operating unit demands at lower replenishment cost per demand than any other alternative.

Research Questions and Findings

Research Question	Finding
• How should quantitative criteria be evaluated?	• Measure changes in OMA budgets, including potential behavior changes, and AWCF inventory replenishment costs
• Which CPIPT alternatives perform best?	
– OMA impacts	– Interim policy and Dual price+ require less OMA funding, assuming some behavioral change
– AWCF impacts	– Dual price+ can meet higher demands at a lower replenishment cost per demand
• How should the chosen CPIPT alternative be implemented?	

The Army has chosen a modified version Interim policy[40] as its interim price and credit policy during the implementation of SSF because of concerns about the potential financial impacts of exchange pricing on the AWCF and the cost of developing a system to match purchases with returns.[41] However, Dual price+ has some additional benefits that could be gained if certain of its features were incorporated into Interim policy as part of the interim policy. Other features of Dual price+, such as dual pricing, are more difficult to implement in the short term and require additional analysis to determine their effects on AWCF cash flows. The final section of this briefing discusses the key differences between Interim policy and Dual price+ and their effects on OMA budgets and AWCF

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[40] After our analysis was completed, the Army decided to implement the Interim policy with some modifications. Credits for FLRs will be based on a weighted average of depot-level and installation-level repair costs, in proportion to the number of items currently repaired in each location. Credit for serviceable consumables will be set at 3 percent of the purchase price. Thus, our analysis differs somewhat from the actual policy that will take effect in FY01.

[41] Within the Army there is much disagreement about the field's response to exchange pricing. Many believe that fewer carcasses will be returned if exchange pricing is implemented and the Army will not be able to recover the price difference between the exchange price and the full price. Others point to the division comptroller's office, where unmatched "recoverables" are carefully monitored. In today's Army, if a carcass is not returned, the installation OMA account is negatively affected. Under exchange pricing, if a carcass were not returned and the price difference not recovered from the OMA account, the AWCF would be negatively affected.

inventory replenishment costs, differences in implementation, and potential further refinements to Army price and credit policy.

Dual Price+ Incorporates Four Distinct Modifications to Interim Policy

Features	Interim policy	Dual price+	Reasons for modification	Further Analysis
Unservice-able FLR returns	Bases credit on wholesale repair cost	Bases credit on installation repair cost	Recovers true cost	Must review DLR/FLR classification for cost-effectiveness
Serviceable consumable returns	No credit	Credit for items costing more than $50	1. Reduces procurement costs 2. Reduces OMA redistribution activities	1. Identify appropriate dollar level 2. May need to exclude credit for some items
Items in "long supply"	No credit	Item-by-item prices and credits based on desired OMA customer behavior	Current definition of "long supply" not appropriate under SSF	Item-by-item analysis
Dual pricing	Customer pays full price and receives separate credit	Customer pays repair cost plus surcharge for requisition with return	1. Less cash needed by OMA customer and AWCF 2. Reduces number of transactions	1. Requires carcass matching procedures 2. Requires analysis of AWCF cash flows

This chart summarizes the four key distinctions between Interim policy and Dual price+, the reasons why Dual price+ generates benefits relative to Interim policy, and additional analysis that would be needed to refine these modifications to price and credit policy.

First, Interim policy bases credits for unserviceable FLRs on wholesale repair costs, whereas Dual price+ bases these credits (or dual prices) on installation repair costs, which are generally lower.[42] As a result, Dual price+ reflects the true cost to repair FLRs, and it encourages additional demands by lowering the net cost to OMA customers. By setting prices higher than true costs, Interim policy may motivate OMA customers to look for other sources of repair, such as local contractors or expanded direct support (DS) maintenance capability. Under SSF, item managers will need to review the current DLR and FLR classifications to determine whether items can be repaired more cost-effectively at the wholesale or the installation level.

Second, Interim policy gives no credit for serviceable consumable returns, whereas Dual price+ gives credit for serviceable consumable returns with a unit

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[42]In the future the Army plans to establish a repair standard for both DLRs and FLRs, so that regardless of where an item is repaired (installation, depot, contractor), it will be repaired to that standard. Dual price+ would charge the actual cost to repair wherever the item is repaired and to whatever standard the Army establishes.

price greater than $50. (The credit would be AMDF price minus a surcharge to cover handling costs.) Under current policy, OMA customers receive some credit for serviceable consumables, but the low level of credit motivates OMA customers to redistribute these items rather than return them to the supply system. Giving credit for serviceable consumables would bring them back into the supply system, giving the Army greater visibility and scope for redistribution within the supply system and reducing procurement costs from DLA and other vendors. Some further analysis may be needed to determine whether $50 is the appropriate threshold for granting credit, and whether some specific items that cannot be resold should receive credit. However, it should be noted that when the Army purchases a consumable that cannot be used or resold, it incurs a loss, whether this loss is absorbed by the stock fund or by the OMA customer.

Third, Interim policy gives no credit for items in "long supply" at the wholesale level, whereas Dual price+ would set prices and credits for items in long supply based on the desired behavior by OMA customers. For example, if the wholesale system has a long supply of serviceable items, giving no credit to OMA customers would give them an incentive to repair these items rather than buy them, thus reducing demands for the item and increasing total costs to the Army. In this case, it would be better to reduce the price of the item to increase demands and reduce incentives for local repair. The Army's current definition of "long supply" may also cause problems under Interim policy. For some items currently defined to be in long supply, the Army is relying on serviceable returns to meet demands. Cutting off credit for these items is likely to reduce the number of serviceable returns, causing the Army to incur repair costs. Furthermore, when WSF inventories and demands are combined with RSF inventories and demands, the Army will need to establish new ROs, and the set of items defined to be in long supply is likely to change. For items in long supply, an appropriate price and credit policy will require an item-by-item analysis to determine the most cost-effective location for repair, disassembly, or disposal of each item, along with the price and credit rates that will motivate the desired behavior by OMA customers.[43] (See Appendix E for a further discussion of price and credit policy for items in long supply.)

Fourth, Interim policy charges the full price for requisitions and sends out credits only when returns have been received, whereas Dual price+ charges a net price (full price minus the credit) for requisitions with returns, and assesses a penalty if the carcass is not returned. By eliminating most of the credit transactions, dual pricing reduces the financial management burden on OMA customers, and reduces the amount of OMA they must have to place a requisition. The AWCF

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[43]Because an item-by-item analysis of items in long supply would be required to implement this feature of Dual price+, we could not incorporate it into the current analysis. Instead, we assumed that the net prices and credits for these items would be based on repair and replacement costs.

will also maintain a lower cash balance because both sales prices and credit outflows are reduced.[44] Implementation of dual pricing requires a carcass-matching system to track the returns promised by customers and to assess penalties when they fail to make a return.[45] Some additional analysis would also be needed to determine the impact of dual pricing on AWCF cash flows.

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[44]Under Dual price+ the price of a requisition with a return equals the repair cost plus the surcharge; for most items this is considerably less than the current price, which is latest acquisition cost plus the surcharge. Although credit for unmatched returns increases under Dual price+, our analysis shows that the total amount of credit given by the AWCF drops by 40 percent under Dual price+ when it is implemented with dual pricing.

[45]A concern of the Army is that it lacks an automated system for tracking carcasses that would allow it to penalize units that fail to return carcasses within the allotted time. However, the Army is currently making efforts to add the capability to track unmatched recoverables to new automated systems, such as ILAP. This capability could be used to help implement an exchange price system. Currently, each installation in the Army has its own unique method of tracking unmatched recoverables.

Incrementally Modifying Interim Policy to Be More Like Dual Price+ Decreases the Required OMA Funding
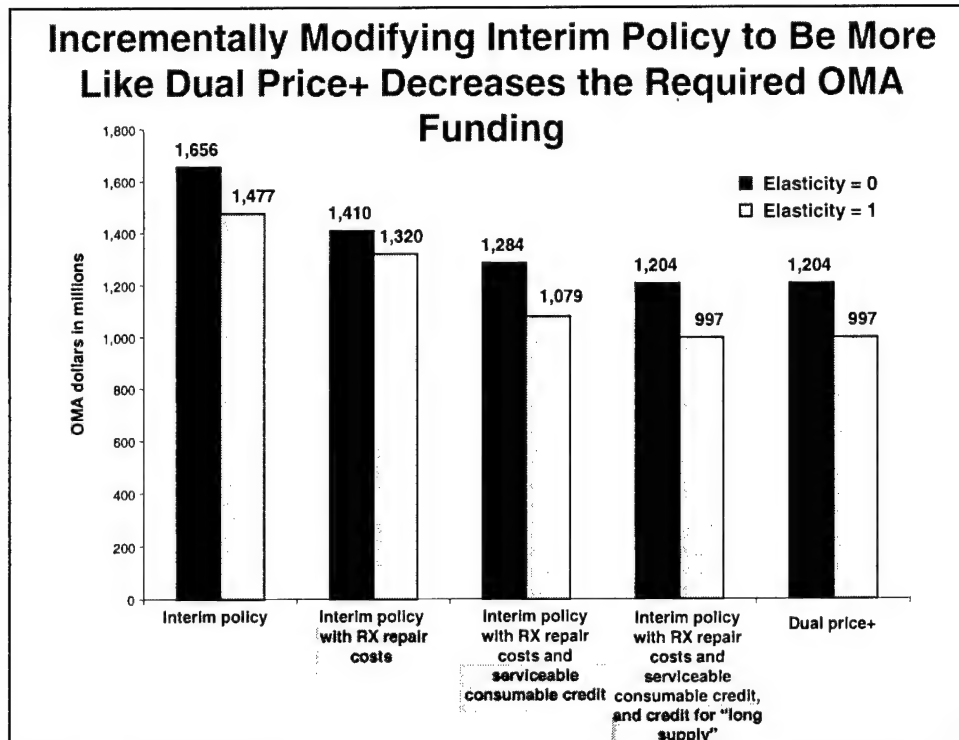
This chart shows the impact of each of the modifications on net OMA expenditures, for elasticities of zero (no change in customer behavior) and one (moderate change in customer behavior). Each of the modifications successively reduces net OMA costs under both assumptions. Basing FLR credits or net prices on installation RX repair costs reduces the costs of requisitions with returns and increases the credit for unmatched unserviceable returns. Giving credit for serviceable consumable returns increases the OMA customer's buying power, and is likely to increase the number of returns when changes in customer behavior are taken into account. Giving credit for items in long supply also reduces the cost of requisitions with returns and increases credits for unmatched returns, leading to increased demands and returns for these items. Dual pricing does not have any additional impact on annual OMA costs. Instead, it changes the size, number, and timing of financial transactions.

Incrementally Modifying Interim Policy to Be More Like Dual Price+ Decreases AWCF Expenditures
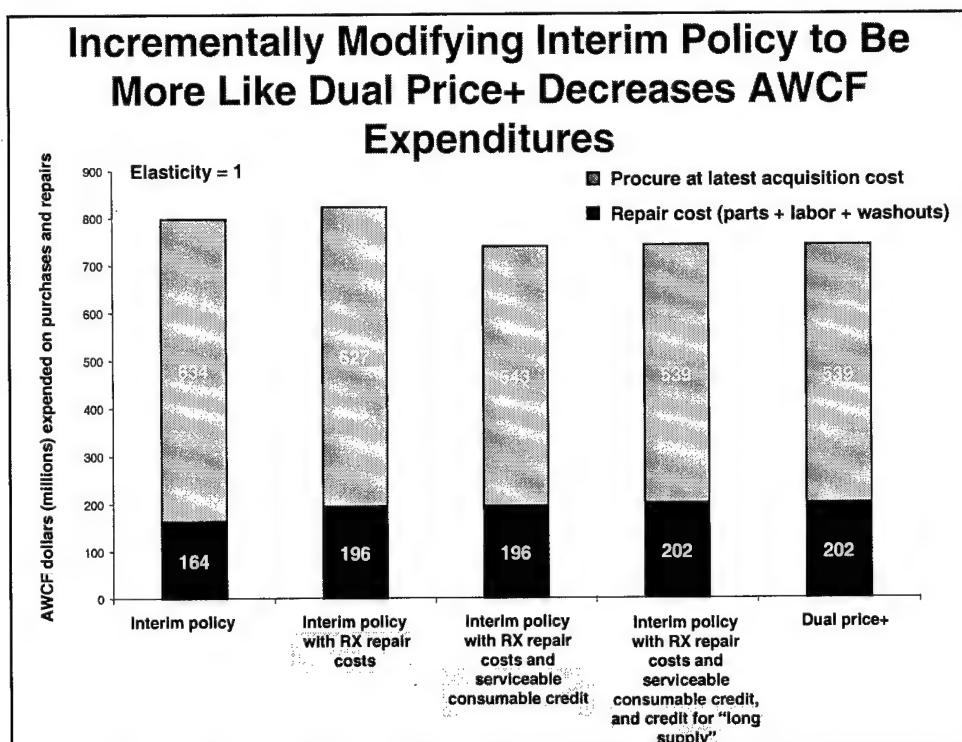
This chart shows the impact of each modification on AWCF inventory replenishment costs, assuming a moderate change in customer behavior. (Inventory replenishment costs remain constant at $725 million if we assume that there are no changes in customer behavior.) Basing credits or net prices for FLRs on installation RX repair costs lowers the OMA cost of requisitions with returns, so it is likely to increase both demands and unserviceable returns for FLRs. As a result, total replenishment costs go up because additional demands are being met by increased repairs. Procurement costs go down slightly because more unserviceable carcasses are available for repair.

Giving credit for serviceable consumable returns reduces procurement costs because more items are available for resale. Giving credit for items in "long supply" increases repair costs and reduces procurement costs by approximately offsetting amounts. This suggests that the Army's current definition of long supply may not be appropriate in a SSF environment. For at least some of these items, the Army is relying on serviceable or unserviceable returns to meet demands. Not giving credit for these items reduces return rates, resulting in higher procurement costs.

As on the previous chart, dual pricing has no additional impact on customer behavior or on replenishment costs, but it does change the size, number, and timing of transactions.

**An Implementation Strategy for an
Improved Price and Credit Policy**

- **Make catalog and SARSS changes required to implement Interim policy**

    - **Requires adding serviceable and unserviceable credits to catalog**

    - **Requires modifying SARSS to look at catalog for credit rather than at credit table**

- **Implement Interim policy with modifications**

    - **Use RX repair costs to calculate credits for FLRs**

    - **Give credit for serviceable returns costing more than $50 or similar threshold**

    - **Give credit for all DLRs and FLRs regardless of supply position until item-by-item policy is developed**

The Army is currently planning to add serviceable and unserviceable credit rates to the Federal Logistics Data (FEDLOG) catalog and to modify SARSS and STARFIARS to implement Interim policy as the interim credit policy for SSF. A variant of Dual price+ with separate price and credit transactions instead of dual pricing could be implemented as the interim credit policy by making similar changes. The Army could thus get most of the benefits of Dual price+ with implementation costs similar to those for Interim policy.[46]

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[46]Some members of the Army financial community have expressed concern that the higher credits offered under Dual price+ would deplete AWCF cash balances rather than bringing more transactions back into the AWCF. These concerns could be addressed by pilot projects that adjusted credits for groups of items to assess the impacts on demands and returns.

Further Refinements

- **Identify those items to be repaired as FLRs and develop a maintenance policy for them**

- **Determine policies for items in long supply on an NSN-by-NSN basis**

- **Directly fund surcharge costs and allocate variable costs (e.g., transportation and restocking costs) to individual items**

- **Implement dual pricing**
  - **Requires carcass-matching procedures**

The analysis reported in this document was constrained by the definition of five specific policy alternatives. Underlying the formulation of each of the alternatives was the requirement that the policy would have to be implemented using existing Army supply and financial management systems. However, the Army is currently developing a new automated logistics support system called Global Combat Support System–Army (GCSS-A).[47] With its implementation, the Army has the opportunity to further improve its price and credit policy. Thus we suggest some additional refinements that could lead to an even better price and credit policy than Dual price+.

NSNs that are currently being repaired at installations should be reviewed to determine if that is the appropriate level for repair. In addition, NSNs being repaired at the Army's depots or contractors should be studied to determine if they could be repaired more economically elsewhere.

Once wholesale and retail stocks are combined, new policies for identifying and managing NSNs in long supply will be required. These policies should be tailored to the individual NSN. For example, an NSN that has many

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[47]More information on this system can be found at *http://www.cascom.lee.army.mil/automation/ GCSS-Army_Global_Combat_Support_System-Army/i.* According to this Web site, "the Global Combat Support System is the world's first truly integrated logistics support system encompassing the functions of supply, finance, transportation, maintenance, and personnel."

unserviceable assets and few serviceable assets should be reviewed to determine the appropriate price and credit so that serviceable assets in the field can be used as a source for filling demands before unserviceable carcasses are repaired.

As will be discussed in the forthcoming publication *Right Price, Fair Credit: Criteria to Improve Financial Incentives for Army Logistics Decisions,* the Army must review each component of the surcharge and consider direct funding those components not directly related to Army supply management activities. This would avoid distorting customers' supply and repair decisions. The costs that vary on an NSN-by-NSN basis, such as transportation and restocking costs, condemnation rates, or losses and obsolescence, could be allocated to individual prices or credit rates on an NSN-by-NSN basis.[48]

Implementation of dual pricing would require the development of a carcass accounting system to ensure that unserviceable carcasses were turned in when the unit paid the lower price for a requisition with a return.[49] Units that failed to turn in a carcass would have to be penalized by the value of the carcass, i.e., LAC minus the repair cost of the NSN.

Dual pricing has the advantages of reducing the number of financial transactions and simplifying unit-level financial management.[50] However, its effects on AWCF cash balances and its implementation costs would have to be analyzed. The Army's automated systems currently include some capabilities that could be used as a starting point for a carcass accounting system. For example, SARSS has an unmatched recoverables report, and the Integrated Logistics Analysis Program (ILAP) has the capability to help units match their requisitions and returns.

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[48]Direct funding of surcharge costs is a reform that has been recommended by almost everyone who has looked at stock funding of DLRs. Most notably, Baldwin and Gotz (1998, p. 39) say "Recommendation 1: Costs unrelated to rate of repair should be recovered from customers, but not through DLR prices." Also see the documents by Rogerson (1995), Trunkey and Choi (1996), and Wallace et al. (1999) listed in the bibliography. Until recently, OSD policy required full costs to be recovered through prices. However, the Defense Working Capital Fund Reform Task Force (chartered in 1998) recommended, "Change Pricing Structure . . . Allow Components to propose—through the normal budget process—prototypes that collect total costs through means other than price." This recommendation was approved by the Deputy Secretary of Defense in January 2000. The Army is concerned that there must be a mechanism for recovery of costs from all its customers, including Air Force, Navy, Marine Corps, Foreign Military Sales, and others. It believes that direct funding could lead to the Army paying for more than its share of fixed costs.

[49]A carcass accounting system would not require serial number tracking or one-to-one matching of requisitions with returns, but simply a matching of returns against the oldest due-in.

[50]A 1993 Army study of dual pricing predicted that it would increase the number of transactions, resulting in a $30–40 million annual increase in DLA Distribution Depot charges. Although we have not been able to review this study, this prediction was apparently based on the assumption that carcass returns could not be tracked unless DLRs were issued one at a time and that this would cause the increase in DLA charges. It appears, however, that the Army is already moving to a process of "single" issues under the new SSF business rules whereby consolidation of requisitions at the SSAs are being eliminated because of the elimination of RON/DON.

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APPENDIX A: DETAILED SPECIFICATIONS OF CREDIT AND PRICING POLICIES

Any comprehensive credit and pricing policy must explicitly account for four types of supply transactions:

1. Purchases with returns, called "exchanges": An unserviceable DLR (depot-level reparable) or FLR (field-level reparable) is returned and a serviceable one is purchased to replace it.

2. Purchases without returns: This transaction type includes all purchases of consumables, for which there are no exchanges.

3. Returns of serviceable items without a matching purchase.

4. Unmatched returns of unserviceable items (chiefly DLRs and FLRs).

The CPIPT developed four alternative pricing and credit policies. To this list, the Army Director of Supply and Maintenance Policy added a fifth alternative. The three panels of Table A.1 summarize how current price and credit policy and each of the alternative policies addresses the four types of supply transaction for DLRs, FLRs, and consumables, respectively. Below we define the formulas used in Table A.1 and explain how the surcharge is calculated.

CURRENT ARMY FORMULAS

AMDF price = LAC + surcharge

The surcharge is a constant percentage of AMDF price for each MATCAT, used to recover the operating costs of wholesale Supply Management and other logistics-related activities. Surcharge rates for FY98 and FY99 are shown in Table A.2.

Wholesale serviceable credit = AMDF price – surcharge

Wholesale unserviceable credit = AMDF price – surcharge
                                   – wholesale repair (adjusted for washouts)

Wholesale repair cost (adjusted for washouts) =
                                   (1 – washout rate) * repair cost
                                   + (washout rate) * LAC

Table A.1

Summary of CPIPT Alternatives

DLRs	**Requisition with Return** price by NSN	**Requisition without Return** price by NSN	**Serviceable Return no Requisition** credit by NSN	**Unserviceable Return no Requisition** credit by NSN
Current	45–55% of AMDF	AMDF	Below RL: 100% of AMDF Above RL: 45–55% of AMDF	45–55% of AMDF
Dual price	wholesale repair cost + surcharge	AMDF	no credit	no credit
Reduced credit	wholesale repair cost + surcharge	.75 * AMDF	.75 * AMDF – surcharge	.75 * AMDF – surcharge – wholesale repair cost
Market price[a]	return rate * wholesale repair cost + (1 – return rate)*(AMDF – surcharge)		no credit	no credit
Interim policy	AMDF – wholesale unserviceable credit	AMDF	wholesale serviceable credit	wholesale unserviceable credit
Dual price+	wholesale repair cost + surcharge	AMDF	AMDF – surcharge	AMDF – surcharge – wholesale repair cost

FLRs	**Requisition with Return** price by NSN	**Requisition without Return** price by NSN	**Serviceable Return no Requisition** credit by NSN	**Unserviceable Return no Requisition** credit by NSN
Current	Below RL: 20% of AMDF Above RL: 85–95% of AMDF	AMDF	Below RL: 100% of AMDF Above RL: 5–15% of AMDF	Below RL: 80% of AMDF Above RL: 5–15% of AMDF
Dual price	RX repair cost + surcharge	AMDF	no credit	no credit
Reduced credit	RX repair cost + surcharge	.75 * AMDF	.75 * AMDF – surcharge	.75 * AMDF – surcharge – RX repair cost
Market price[a]	return rate * RX repair cost + (1 – return rate)*(AMDF – surcharge)		no credit	no credit
Interim policy	AMDF – wholesale unserviceable credit	AMDF	wholesale serviceable credit	wholesale unserviceable credit
Dual price+	RX repair cost + surcharge	AMDF	AMDF – surcharge	AMDF – surcharge – RX repair cost

[a]Direct fund surcharge.

Consum-ables	Requisition with Return	Requisition without Return	Serviceable Return no Requisition	Unserviceable Return no Requisition
	price by NSN	price by NSN	credit by NSN	credit by NSN
Current		AMDF	Below RL: 100% of AMDF Above RL: 5–15% of AMDF	5–15% of AMDF
Dual price		AMDF	no credit	no credit
Reduced credit		AMDF	no credit	no credit
Market price[a]		AMDF	no credit	no credit
Interim policy		AMDF	no credit	no credit
Dual price+		AMDF	> $50: AMDF – surcharge < $50: no credit	no credit

[a]Direct fund surcharge.

Table A.2

Surcharge Rates for FY98 and FY99

First position of MATCAT	Surcharge Rates	
	FY98	FY99
B	11.5%	18.9%
C	17.8	25.3
D	17.8	25.3
E	17.8	25.3
F	17.8	25.3
G	23.2	31.5
H	11.5	18.9
J	17.8	25.3
K	18.7	25.7
L	21.5	30.6
M	26.3	33.5
P	17.8	25.3
Q	17.8	25.3
R	17.8	25.3
S	17.8	25.3
T	17.8	25.3
U	23.2	31.5
X	17.8	25.3
—	17.8	25.3

NOTE: We assigned the average SMA surcharge rate to consumable MATCATs (B–F, J, P–T, and X) for the purpose of calculating credit rates for consumables under Dual price+. The surcharge is deducted from the credit as a "service charge" for handling the item.

APPENDIX B: DATA SOURCES AND DESCRIPTION

Simulation Data Came from Many Army Sources

- **11 SARSS CTASC sites**
  - Issues and returns (OMA to AWCF and AWCF to OMA)
  - Asset balance file (ABF)
- **September 97 Budget Stratification of wholesale inventories**
- **STARFIARS (Forts Hood & Campbell, various periods)**
  - Initial wholesale unserviceable credits by NSN for items in file; wholesale surcharges by MATCAT
  - "Reality check" for financial simulations based on CTASC data
- **EMIS — RX repair costs, NSNs in RSF repair**
- **AMDF — MATCAT and price**
- **NSNMDR — Wholesale serviceable/unserviceable credit rates**
- **RPI — Customer response to price changes**

Our evaluation of the alternative price and credit policies required data from many sources. We used SARSS CTASC (Corps/Theater ADP Service Center) data as the source of transactions between OMA and the AWCF. We obtained approximately one year of data from each of the Army's 11 CTASC sites covering various periods, mostly within fiscal year (FY) 1998. We then scaled up the transactions so that they were representative of an entire year's worth of issues and receipts.[50] We also

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[50]However, our figures for total net OMA expenditures do not match total RSF sales net of credits because all Army customers were not yet on SARSS during FY98, particularly in TRADOC; further, some types of transactions are not recorded in SARSS, such as local purchases and credit card transactions. We have approximately $1.7 billion in net transactions between OMA and RSF under current policy, whereas the RSF had sales of approximately $4 billion in FY98.

used the SARSS Asset Balance File (ABF) to obtain RSF inventories and ROs.

Information on the Army's WSF inventories and ROs came from the September 1997 Budget Stratification file. This file gives the dollar value of the Army wholesale inventory by NSN. We converted the dollar figures to quantities by dividing by the price of each NSN.

Financial transactions between OMA and the AWCF are found in STARFIARS. We used this data in our preliminary analysis of Forts Hood and Campbell as a source of WSF serviceable and unserviceable credit rates and surcharge rates by MATCAT, and to help verify the financial totals for our simulation of current price and credit policy.

The Army's ISM program collects data on all GS maintenance activities on installations that participate in ISM. The system that collects this information is called the Executive Management Information System (EMIS). We used this data to calculate RX and ISM repair costs for FLRs.

The Army Master Data File (AMDF) was our source for LAC, MATCAT, and Materiel Recovery Code (MRC). The MATCAT and MRC help to identify whether an NSN is a DLR, FLR, or consumable.

More comprehensive information on WSF serviceable and unserviceable credit rates came from the NSNMDR (National Stock Number Master Data Record).

Finally, we used the Reduced Price Initiative (RPI) list from FY94 through FY97 to help estimate customer response to price changes.

APPENDIX C: DETAILS ON OMA EXPENDITURES FOR EACH ALTERNATIVE

OMA Expenditures Vary by Type of Supply Transaction

The charts on pages 26 and 27 show an aggregate comparison of the OMA expenditures under each alternative. By looking at the OMA funding required for the four types of supply transactions described in Appendix A—requisitions with returns, requisitions without returns, serviceable returns, and unserviceable returns—we gain more insight into the actual differences between the alternatives.

The first section of Table C.1 shows the total prices and credits that would have been paid under each alternative for the actual demands and returns observed in our SARSS CTASC data. (These data include all types of items—DLRs, FLRs, and consumables—and all sources of supply.) Columns two and three show the OMA dollars in millions required to fund requisitions with returns and requisitions without returns for each of the alternatives. Note that for requisitions with returns, Dual price, Reduced credit, and Dual price+ each require $418 million, because each charges the same net price based on repair costs plus the surcharge. Interim policy is comparable to the current policy, which requires slightly more than $600 million, because it simply reverses the MATCAT averaging of the current retail credit policy.

For requisitions without returns, Dual price, Interim policy, and Dual price+ require the same OMA funds as the current policy, because they all charge the current price for these transactions. Reduced credit requires less funding because the price is assumed to be lowered to 75 percent of the current price at the end of the price and credit adjustment process. Market price requires the least OMA funds for requisitions with returns ($308 million) and for requisitions without returns ($1,226 million), because it directly funds surcharge costs. However, an additional $419 million would be needed under Market price to fund the surcharge costs that would have been recovered by these requisitions.

Columns four and five of Table C.1 show the total credit that OMA customers receive for serviceable or unserviceable returns with no matching requisitions. Dual price and Market price give no credit for unmatched returns. Reduced credit gives less credit than current policy,

Table C.1

Required OMA Funding in Millions for Each Alternative
(All Items—DLRs, FLRs, Consumables; All Sources of Supply)

Alternative	Requisitions with Returns Price by NSN	Requisitions Without Returns Price by NSN	Serviceable Returns Credit by NSN	Unserviceable Returns Credit by NSN	Total OMA (Prices – Credits)
Required OMA funding with actual demands and returns					
Current	$606m	$1,452m	$195m	$194m	$1,668m
Dual price	418	1,452	0	0	1,869
Reduced credit	418	1,283	183	166	1,352
Market price	308	1,226	0	0	1,534[a]
Interim policy	618	1,452	220	193	1,656
Dual price+	418	1,452	390	275	1,204
Required OMA funding when customers respond to price/credit changes (elasticity = 1)					
Current	$606m	$1,452m	$195m	$194m	$1,668m
Dual price	572	1,452	0	0	2,024
Reduced credit	572	1,452	211	177	1,636
Market price	439	1,402	0	0	1,842[a]
Interim policy	590	1,452	326	239	1,477
Dual price+	572	1,452	635	392	997

[a] For comparison, the surcharge of $419 million must be added into the total for Market price.

because it lowers prices and credits in parallel. Total credits under Interim policy are similar to the current policy, because it simply reverses credit averaging by MATCAT. Dual price+ gives the most credit for unmatched returns, in particular, because it is the only alternative that gives credit for consumable returns, and because it gives credit for unserviceable FLRs based on installation-level repair costs (unlike Interim policy, which bases unserviceable FLR credits on wholesale repair costs).

The last column—total OMA—is the sum of columns two and three less columns four and five. Dual price and Market price (when surcharge costs of $419 million are included in the total) require higher total OMA funding, because they give no credit for unmatched returns. Reduced credit requires less OMA funding than current policy because the effects of lowering prices outweigh the effects of lowering credits. Interim policy requires approximately the same OMA as current policy. Dual price+ requires the least OMA funding because it gives more credit for unmatched returns.

The second section of Table C.1 shows the total prices and credits that would be paid under each alternative, accounting for potential behavioral change using an elasticity of 1.[51] This elasticity is used to estimate quantity changes in each category of transaction. In the second and third columns of Table C.1, price and quantity changes tend to be offsetting, because quantities fall when prices rise, and quantities rise when prices fall. The direction of change under each alternative depends on which directional effect is dominant.[52] In the fourth and fifth columns, price and quantity changes move in the same direction, because returns rise when credits rise, and fall when credits fall. Thus, Dual price and Market price, which offer no credit, and Reduced credit, which offers less credit on average for unserviceable returns, all require more OMA than when quantities are held constant. Interim policy eliminates credit averaging by MATCAT and condition, so credits increase for serviceable returns, resulting in higher total credits. For unserviceable returns, some credits are increasing and others are decreasing, but the net effect is higher total credit. Thus, Interim policy requires less OMA than when quantities are held constant. In addition to eliminating credit averaging, Dual price+ offers credit for serviceable consumable returns and credit for unserviceable FLRs based on installation-level repair costs, so it requires the least total OMA funding when possible behavior changes are taken into account.

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[51]The results shown in the first section of Table C.1, where quantities are held constant, are equivalent to an elasticity of zero. To obtain the results in the second section of Table C.1, we chose a moderate level of elasticity to show the direction of the effects that would result under each alternative if OMA customers change their behavior in response to price and credit policy changes. We also limited quantity changes to no more than double nor less than half, except for returns, which were allowed to fall to zero. We repeated the analysis under varying assumptions about elasticity, but the relative ranking of the alternatives did not change.

[52]Note that the price and quantity effects exactly cancel out for requisitions with returns under Reduced credit. In general, an elasticity of 1 implies that customers hold total expenditures constant for each item, i.e., quantity changes exactly offset price changes. However, because we limited the size of quantity changes for some items (see previous footnote), total expenditures across all items change for most of the alternatives.

The Effect of SSF Prices and Credits Varies Dramatically by Location
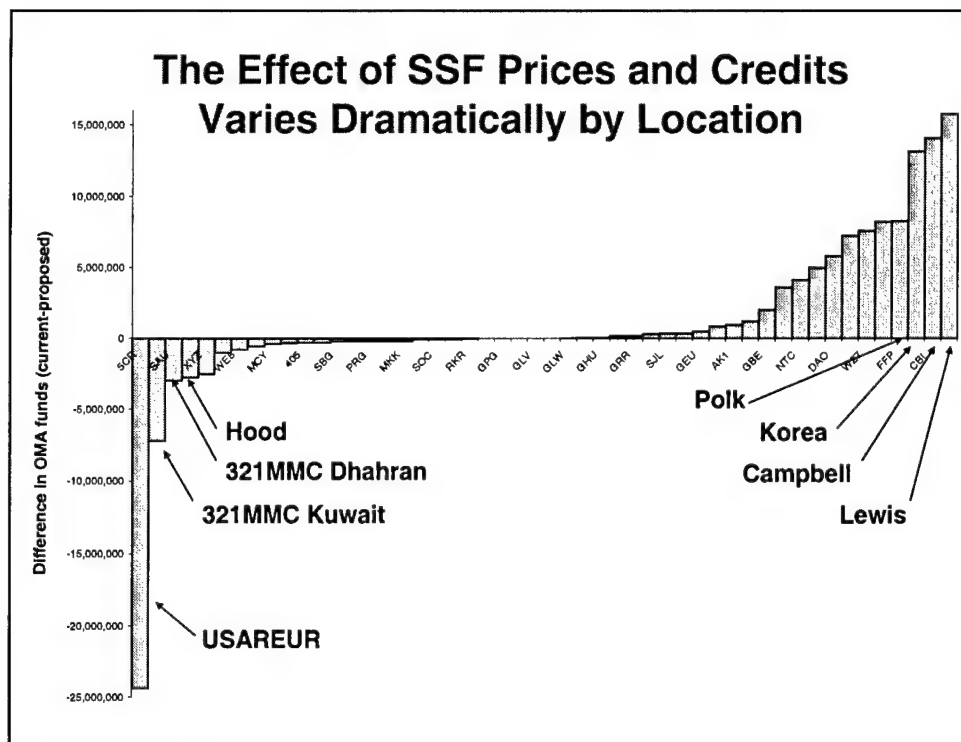
OMA Expenditures Vary by Location

As the chart on page 27 showed, Army-wide OMA funding needed under the Interim policy is almost the same as current policy, holding demands and returns constant. However, when the Army implements the Interim policy, the OMA funding needed by individual installations to maintain OPTEMPO may vary dramatically, as shown on this chart.[53] On the vertical axis is the difference between current OMA expenditures and the OMA budget that would be needed to fund exactly the same supply transactions (purchases and returns) under the Interim policy. The chart shows that USAREUR, the 321MMC, Fort Hood, and other installations would require more OMA funds to purchase and return exactly the same items they purchased and returned in FY98. Forts Lewis and Campbell and other installations would require less OMA funds.

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[53]The data in this chart are based on a CD-ROM of proposed prices and credits for FY01, so they reflect the modified version of the Interim policy that the Army plans to implement. (See the note on page 41.)

These differences occur because the current policy bases credit on the installation NAP. Installations with many assets above the retention limit receive less credit under current policy than installations with a leaner asset position. Under the Interim policy, credit for FLRs and DLRs is based on the Army's need, and there is a 3 percent credit for consumable returns. Because the Interim policy will affect different installations in different ways, it is important to understand that some OMA funding flexibility will be required during the transition to a new credit policy.

APPENDIX D: EFFECTS ON AWCF REPAIR AND PROCUREMENT COSTS

Current Army policy is to replenish inventory to the RO. However, when we combined the ROs for the wholesale and the retail stock funds by NSN, we found that some items had new ROs that were far greater than recent demand history would warrant and far larger than the current on-hand serviceable inventory. Thus, we compared the inventory replenishment costs of each of the alternatives using more conservative replenishment rules. Table D.1 shows the results for two replenishment rules:

1. Replenish to the smaller of the RO or the on-hand serviceable inventory, and

2. Replenish to the smaller of the RO or one-third the distance between the on-hand serviceable inventory and the RO.

When there is no change in customer behavior, the quantities purchased and returned are the same under each alternative, so AWCF replenishment costs are the same as under current policy. The results reported in Table D.1 assume an elasticity of 1, to show the direction of change in costs if OMA customer behavior changes in response to prices and credits. Under each replenishment rule, we assume that the AWCF always uses the least expensive source of supply available. Thus, the AWCF first sells off inventory above the RO, then resells serviceable returns when they are available, then repairs when unserviceable carcasses are available, and procures only as a last resort. As a result, when demands and returns change in response to price and credit changes, AWCF replenishment costs can go up or down.

The changes in replenishment costs for each alternative relative to the current policy are similar for both replenishment rules. Under all of the alternatives except Interim policy, requisitions with returns increase, resulting in higher repair costs. Repair costs are particularly high for Market price, because demands increase even more when the surcharge is taken out of prices. Procurement costs are strongly affected by serviceable and unserviceable return rates. Dual price and Market price, which offer no credit for unmatched returns, have fewer serviceable returns available for resale and fewer unserviceable returns available for repair, so

procurement costs increase. Procurement costs are higher for Reduced credit for three reasons. First, requisitions without returns increase because prices are lower. Second, unmatched unserviceable returns are lower, so fewer carcasses are available for repair. Third, since Reduced credit offers no credit for consumables, procurement costs for consumables are higher.

Interim policy has higher procurement costs primarily because it offers no credit for serviceable consumables, so fewer returns are available for resale. Dual price+ results in the lowest procurement costs because it has the most generous credit policy. More serviceable returns, particularly consumables, are available for resale, and more unserviceable assets are available for repair.

Table D.1

AWCF Replenishment Costs in Millions

Alternative	Repair Costs (Parts + Labor + Washouts)	Procurement Costs (LAC)	Total (Repair + Procure)
Replenish to the smaller of the on-hand serviceable inventory or the RO			
Current	$167m	$558m	$725m
Dual price	226	651	877
Reduced credit	229	663	892
Market price	289	697	986
Interim policy	164	634	798
Dual price+	202	539	741
Replenish to the smaller of the RO or one-third the distance between on-hand serviceable inventory and the RO			
Current	$224m	$1,077m	$1,301m
Dual price	280	1,192	1,472
Reduced credit	282	1,198	1,480
Market price	339	1,250	1,589
Interim policy	220	1,159	1,379
Dual price+	259	1,053	1,312

APPENDIX E: PRICE AND CREDIT POLICY FOR NSNs IN "LONG SUPPLY"

For Items Not in "Long Supply," Policies Should Encourage Serviceable Returns to Help Avoid Buys and Repairs

NIIN 013712475	RO = 153		
Dampener, Flutter	Serviceable	Unserviceable	Total
Inventory position	69	378	447
Returns	232	200	432
Demands	263		263

For this item, serviceable returns satisfied the majority of demands

For items in long supply, serviceable and unserviceable credits can be adjusted to motivate desired supply and maintenance policies

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This example illustrates the importance of examining the impact of the alternative price and credit policies on wholesale inventories. By some measures this item is in "long supply," meaning that the Army has more items than it is likely to be able to use. The inventory position (447) is greater than the requirements objective (RO = 153) and represents many years of supply, based on annual net demands (demands minus serviceable returns = 31).

However, if the Army were to establish a policy that discouraged serviceable returns to the supply system, it would have to make repairs (and incur repair costs) in order to meet demands. This might lead to an availability problem if a repair program could not be set up quickly enough. Most of the inventory is in unserviceable condition. The Army needs serviceable returns to satisfy the demands and at some point must begin repairing unserviceable items.

We note that the Army has questioned why there are so many serviceable returns. Recent research has shown that there is no simple answer.[54] Some of the causes are as follows:

1. Periodic serviceable returns occur after Authorized Stockage Level (ASL) reviews when the requisitioning objective (RO) has been lowered. This results in the return of serviceable stock to the AWCF.

2. Recurring serviceable returns come from

   - Customer cancellations for which the SSA could not stop shipment

   - Component repairs without a customer requirement (repair to excess)

   - Mismatches between the ordered and receipted part number

   - Quantity errors

   - System rejections of obsolete items that are still valid substitutes

   - Diagnostic changes by maintenance after an order for an item is placed that negate the need for the item

   - Order entry errors

   - Ordering parts to repair a broken item and then sending the item to a higher echelon of maintenance for repair before the parts arrive, or sending the item without the parts.

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[54]The source of information in this paragraph is unpublished RAND research by Eric Peltz, Art Lackey, Marc Robbins, and Mark Totten, "Supply Chain Quality: Getting the Right Part and Only the Right Part."

Under Interim Policy, Zero Credit for Serviceable Reparables in "Long Supply" Increases Repair Costs

	Serviceable Inventory	Demands	Serviceable return	Demands that must be filled by repair or procurement	Repair Cost
DLR	11	66	0	55	$6,125
DLR	0	2	0	2	$2,640
DLR	0	13	4	9	$1,693
DLR	5	11	1	5	$27,943
DLR	24	39	1	14	$11,028
DLR	4	10	1	5	$2,302
DLR	12	36	6	18	$5,500
FLR	21	29	5	3	$2,173

- **Credit given for returns stays within the Army**
- **Money spent on repair or procurement leaves the Army**

This chart shows several DLRs and an FLR (first column) that are currently receiving zero credit in the NSNMDR file and would receive zero credit under Interim policy. The second column indicates the amount of serviceable inventory available to meet the demands, shown in the third column. The fourth column shows the serviceable returns in the CTASC data that are available to fill demands under current credit policy. The fifth column is the difference between demands and the sum of serviceable inventory and returns. For all of these items, some demands must be met by either repair or procurement. Giving zero credit for serviceable returns is likely to reduce returns of serviceable assets, increasing the number of items that will need to be repaired or procured. Because money spent on credit for returns is returned to Army customers, and money spent on repair or procurement is an expenditure for the Army, a policy of zero credit for items in long supply is likely to increase the Army's total expenditures.

The first DLR on this chart is a good example. If the Army gives credit to customers with excess serviceable items equal to the cost of the item less a surcharge for transportation and restocking, it can then resell the returned item to another customer for full price. Thus, the Army can recover its

transportation and restocking costs, and avoid the $6,125 repair cost or an even higher procurement cost.

Items that the Army genuinely has in excess should be considered on an item-by-item basis. In some cases, credit for serviceable returns is in the Army's best economic interest. In other cases, a reduced price for requisitions may be appropriate.

APPENDIX F: SENSITIVITY OF RESULTS TO ASSUMPTIONS AND DATA

To Test the Sensitivity of Results, We Performed a Computational Experiment

- **Influence of elasticity—4 levels:**
  - **1.0**
  - **0.5**
  - **Elasticity between 0 and 2 chosen at random from a uniform distribution**
  - **Elasticity of 0 for items with essentiality code = C**

- **Impact of having less than total MACOM demands— 3 levels of scaling:**

  CTASC,   RSF,   (CTASC + RSF) / 2

- **Effects of particular demand streams—up to 4 bootstrap samples of demands and returns**

To see if the ranking of the alternatives was influenced by the assumptions used in the analysis or by the particular demand stream in the data, we performed a computational experiment to test for changes in the rankings.

The first variation looked at the influence of the elasticity assumption. The results reported in the main text used an elasticity of 1.0. The next two charts compare the effects on Interim policy and Dual price+ under this assumption with three other elasticity assumptions. The first two alternative assumptions are an elasticity of 0.5 and an elasticity between 0 and 2 chosen at random. To account for the possibility that customer behavior may be different for critical items than for noncritical items, the third alternative assumption sets the elasticity to 0 for any item with an

essentiality code of "C"[55] and retains an elasticity of 1 for all other items. Thus, the demand and return rates for essential items would be the same regardless of the price or credit.

The second variation changed the scale of total demands and returns. As noted in Appendix B, the dollar value of the supply transactions in the CTASC data was less than the dollar value of Retail Stock Fund (RSF) financial transactions over the same period. We looked at three levels— demands and returns in the original CTASC data, CTASC demands and returns scaled to equal the total dollar value in the RSF reports, and CTASC demands and returns scaled to halfway between the CTASC dollar value and the RSF dollar value.

Finally, we evaluated the alternatives under variations in the demand stream by using four different bootstrap samples of demands and returns. A bootstrap sample was obtained by selecting demands and returns at random with replacement from the original data until the same number of requisitions and returns had been recorded within each routing identifier code in a geographical area (RIC-GEO). For an extensive discussion of the bootstrap, see Efron and Tibshirani.[56]

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[55]This code identifies repair parts that are essential to the operation of the weapon system. If the part breaks down, the weapon system can no longer perform its mission. *User Level Code Reference Guide for ARMS Monthly AMDF and I&S History File,* CDA Pamplet No. 18-1, June 1991.
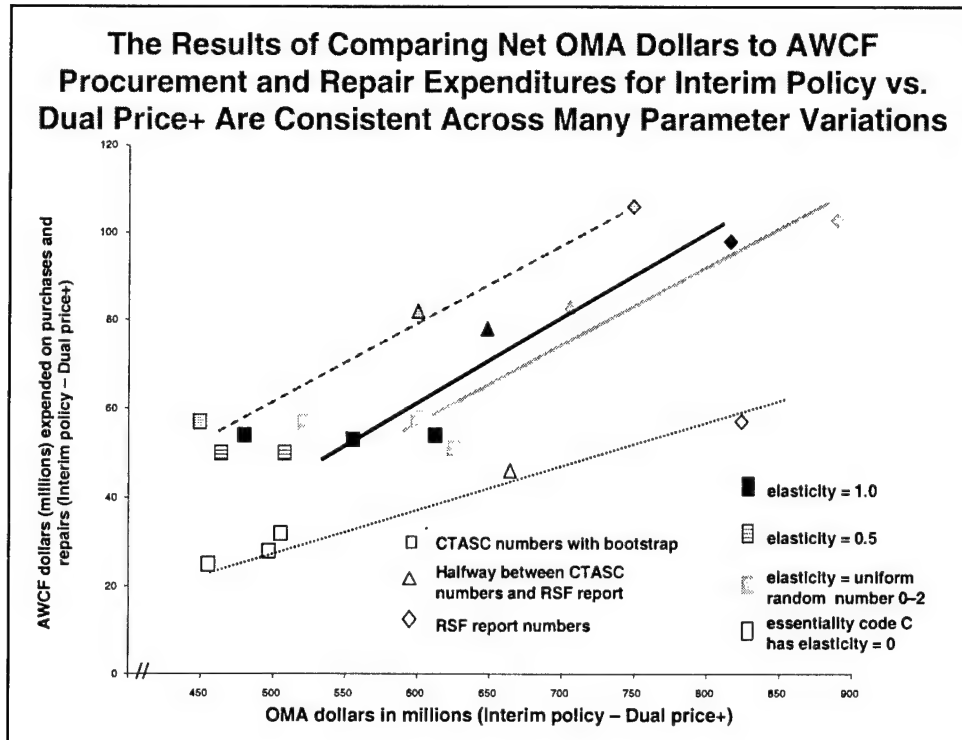
[56]Brad Efron and Rob Tibshirani, *An Introduction to the Bootstrap,* London, New York: Chapman & Hall, 1993.

The Results of Comparing Net OMA Dollars to AWCF Procurement and Repair Expenditures for Interim Policy vs. Dual Price+ Are Consistent Across Many Parameter Variations
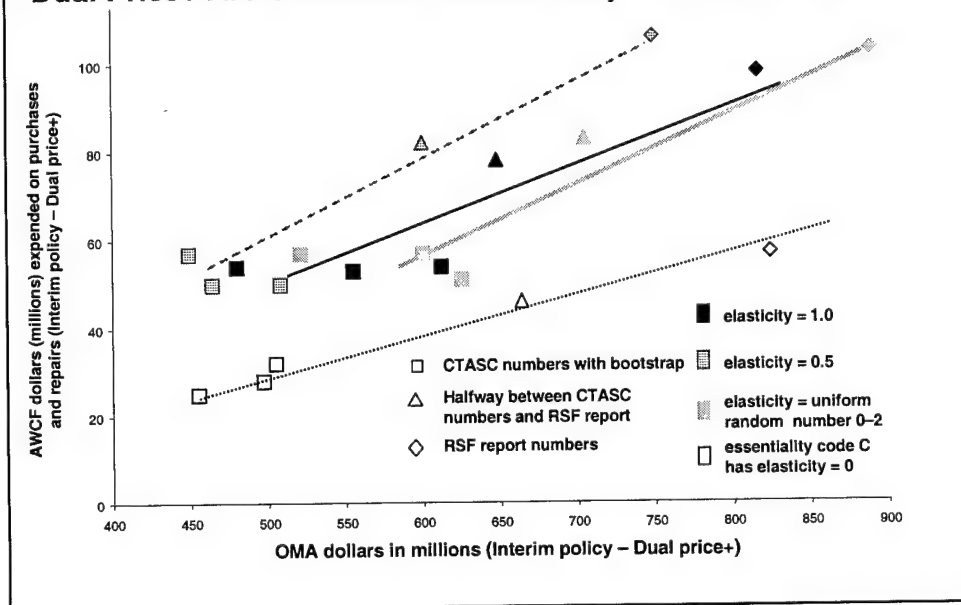
This graph shows a comparison of Interim policy and Dual price+ under different elasticity assumptions and variations in demand streams. Interim policy always requires more OMA funding and has higher AWCF replenishment costs. The horizontal axis plots the difference in OMA funding (Interim policy minus Dual price+) in millions of dollars. The vertical axis plots the difference in AWCF procurement and repair costs (Interim policy minus Dual price+) in millions of dollars. Since the data points are all located in the positive quadrant, Interim policy has a higher cost than Dual price+ in each case.

For example, the lower-left square plots the results using one of the bootstrap samples and an elasticity of 0 for essential items. This point shows that Interim policy requires $455 million more in OMA funding and $25 million more in AWCF replenishment costs than Dual price+. The square furthest to the right plots the results using one of the bootstrap samples and a random elasticity between 0 and 2 chosen from a uniform distribution. This point shows that Interim policy requires $625 million more in OMA funding and $51 million more in AWCF replenishment costs than Dual price+.

The Results of Comparing Net OMA Dollars to AWCF Procurement and Repair Expenditures for Interim Policy vs. Dual Price+ Are Consistent Across Many Parameter Variations

This graph is similar to the graph on the previous page; it has the same axes and the same numbers plotted in the square boxes as the previous graph. In addition, it shows the effects of scaling up the total demands and returns. The triangles represent scaling halfway between the CTASC total dollar value of transactions and the RSF totals for each of the elasticity variations. The diamonds represent the results when demands and returns are scaled to match the dollar values in the RSF.

The diamond furthest to the right shows the results using the RSF report totals and a random elasticity between 0 and 2 chosen from a uniform distribution. It shows that Interim policy requires $889 million more in OMA funding and $103 million more in AWCF replenishment costs than Dual price+.

APPENDIX G: CPIPT REPRESENTATIVES

	General Officer Support Group	CPIPT	Work Group
ASA FM&C	MG Gill	Mr. Roberts	
		Mr. Meyer	Dick Anderson
		Mr. Gregory	Bill Swanson
		Mr. Young	Dave Rogers
			Steve Bagby
ASA IL&E		Ms. Condon	William Croom
PAED	MG Rigby	Dr. College	MAJ Teresa Gerton
DCSOPS	MG Laporte		
DAMO-TR		COL Compain	Gordon Quick
DAMO-ZR		COL Main	Ruben Morin
DCSLOG	MG Cannon	Mr. Burdt	
DALO-RMI		COL Fellers	Max McClellan
DALO-SMP		COL Mangual	Regina George
PM-SSF		Ms. Baker	Mike Ramsey
ACSIM	MG Whaley	COL Troops	Greg Gerovac
AMC		Ms. Leiby	Tim Rogers
DAAR	MG Baratz		
LOG		COL Chagnon	Fletcher Thornton
			Keith Gafford
COMPT		COL Giancarlo	Pete Illig
			Ron Waidlich
ARC (NGB)	MG Navas		Dale Engle

APPENDIX H: SIMULATION MODEL

The simulation began with a file-building exercise. Data arrived from numerous disparate sources. They had to be merged. Parameters had to be imputed where data were missing (e.g., we substituted MATCAT-wide average credit rates when data were not available for a specific NSN). The goal was to build a file where each record reflected the year's experience (purchases, returns, cash flows) for each NSN at each geographic location. This file was then tabulated to yield the desired summary results.

The simulation consisted of six basic steps.

1. Input source information from several files;

2. Integrate input data to build a transaction-level record;

3. Build an NSN-level record, summarizing all purchases and returns at a given location for that NSN during the analysis period;

4. Calculate effective prices and credits (dollars per item) for each type of transaction within a record;

5. Recalculate transaction quantities to reflect elasticity of demand, based on differences between effective prices of different policy alternatives; and

6. Aggregate financial flows, and calculate the net adjustment to assets of the Army Working Capital Fund.

Each of these steps is discussed below.

1. Input source information

FLOWS: We obtained approximately a year's worth (September 1997–August 1998) of CTASC transactions from 11 CTASC sites:

304th MMC	Lewis
321st MMC	Sill
Benning	USAREUR
Bragg	USARPAC
EUSA	USARSO
Hood	

Each record describes a type of transaction (purchase or return), the quantity of items involved, an indicator of serviceable or unserviceable status, and the sending and receiving SSAs. We selected only transactions between Retail Stock Fund and OMA customers. The CTASC records also contained an indicator of whether the item was needed anywhere else on the customer's installation, which is the basis for computing credit rates under the baseline alternative.

AMDF: This file contains descriptive information about each NSN: its price, MATCAT (Materiel Category), class of supply, source of supply (indicates if the item is Army-managed), automatic return code, and essentiality code. This file gave one source to determine whether an item was a DLR, an important distinction for the policy alternatives we were attempting to explore. The price was adjusted for the Army surcharge, where appropriate, so that it reflected the actual acquisition cost to the Army.

CREDIT RATE TABLES: We obtained credit rate tables, by MATCAT, as a function of whether NSNs were needed or not needed elsewhere on the installation.

AIMI LIST: This is a list of "Army intensively managed items." We kept these entirely out of the simulations because they are treated differently from other items.

WHOLESALE REPAIR COSTS: We obtained serviceable and unserviceable credit rates for NSNs managed at that wholesale level. The data we were able to obtain did not include all DLRs; for missing NSNs, we imputed these rates using MATCAT-level averages.

FLR LISTS: We constructed lists of field-level repairable items. Any NSN that was repaired 10 or more times at the installation level (as recorded in the EMIS repair data) was classified as an FLR. For these, we estimated the average cost to repair at the installation on a NSN-by-NSN basis. Finally, we adjusted prices for washouts and for items that had to be repaired at depots.

2. Build transaction-level records

Codes on the CTASC records enabled us to define each CTASC transaction as a requisition, requisition with (unserviceable) return, serviceable return, or unserviceable return. We needed to aggregate this information in such a way that we could summarize the cumulative financial transactions for each NSN. A single transaction, for example,

would not identify a requisition with return. That would have to be pieced together from records of purchase and (often somewhat later) returns for credit. We assumed that the credit/return history for each NSN would be explained by the aggregated credits/returns for that NSN within a geographic location.

We eliminated AIMI items and items for which we could not obtain price information through AMDF. We also eliminated items in Materiel Classes 1 (food), 5 (munitions), and 7 (end items). We needed to classify each NSN as a DLR, an FLR, or a consumable, since the proposed alternatives differed in their treatment of these categories. FLRs were first culled out based on the FLR lists we derived from EMIS. DLRs were defined according to codes in the AMDF for the remaining NSNs: {materiel return code is D or L} or {automatic returns indicator is C, E, R, or S}, and {first letter of the materiel category is J, P, or Q}.

NSNs not classified as DLRs or FLRs were assumed to be consumables.

3. Build NSN-level records

This step consisted of counting numbers of transactions for each item and associated dollar amounts for various categories of transaction. To determine materiel flows, we added up the number of purchases, serviceable returns, and unserviceable returns for each NSN in each geographic location. To evaluate the alternative pricing policies, we needed to obtain flows within four categories of transaction:

1. Purchases with (unserviceable) returns,

2. Purchases without returns,

3. Serviceable returns not associated with purchases, and

4. Unserviceable returns not associated with purchases.

The CTASC data only gave us purchases (categories 1 and 2 combined), serviceable returns (category 3), and unserviceable returns (categories 1 and 4). To evaluate policies that used dual pricing, we had to match unserviceable returns to purchases, thereby creating a category representing purchases with returns. For DLRs and FLRs, we compared the total numbers of purchases and unserviceable returns for each NSN. The lower of the two totals represented purchases with returns. If there were more purchases than unserviceable returns, the remaining transactions were counted as purchases without returns. If there were

more unserviceable returns than purchases, the remaining transactions were counted as unmatched unserviceable returns.

4. Calculate effective prices of alternative policies

At this stage, we applied the assigned price and credit rates specified by the five alternative policies. Prices and credit rates were specified for each policy (see Table A.1) by DLR/FLR/consumable status, for each of the four categories of transaction. Each of the policies specified a series of rules for calculating dollar flows per transaction. These flows depended on specified credit rates, as well as repair costs calculated from the EMIS and wholesale repair programs.

5. Recalculate transaction quantities

The methods described in the previous sections gave us numbers of items involved in each type of transaction and the average dollar amount for these transactions. Economic theory suggests that as prices vary, the quantity demanded will vary in the opposite direction. The parameter that governs this response, the "elasticity," is formally defined as the percent change in quantity divided by the percent change in price. We had very little data to guide us on what the elasticities should be. To get a feel for the influence of elasticity assumptions, we made different estimates in which we assumed elasticities of –1.0 and –0.5 across the board. Using these elasticities, we obtained alternative quantities by contrasting effective prices paid under each alternative with the baseline alternative. Location-specific summaries then utilized these alternative quantities. See Appendix F for more discussion of this topic.

6. Aggregate financial flows, adjust AWCF

We totaled material and financial flows for each location and for the system as a whole. Thus, we had numbers of items demanded and their dollar amounts for each of the four categories of flow, by NSN, by policy alternative, with and without elasticity assumptions. This gave us an estimate of the OMA funding required under each of the alternatives. It remained to examine the impact of each of the alternatives on wholesale inventories.

We used the September 1997 Budget Stratification file to determine wholesale inventories. In the simulation, we assumed that OMA demands would be met at minimal cost to the AWCF. We calculated total serviceable and total unserviceable stocks in the retail and wholesale

supply systems, and added the requirements objectives (ROs) from these sources as well. We assumed that serviceable stocks above the aggregated wholesale RO would be used first to satisfy demands; we valued these at zero cost to the AWCF. We assumed that repairs on unserviceable stocks would be used next; we valued these at depot repair costs. Serviceable stocks below the RO would be used next and valued at their replacement cost, i.e., latest acquisition cost; additional stocks, if necessary, would be used last and valued at latest acquisition cost. Ending stocks were required to be the lower of the combined RO or stocks on hand at the beginning of the year. We computed and displayed total AWCF inventory replenishment costs for each policy variation. Of course, alternatives with the same materiel flows (i.e., zero elasticity) showed no difference in inventory replenishment costs.

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